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The Climatology Module CLIMAT

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Abstract

The climatology module CLIMAT provides climatology data both in a stand-alone mode and as input to other modules of the Electro-Optical Systems Atmospheric Effects Library (EOSAEL). The climatology data include averages and standard deviations or percentages of occurrence of 11 meteorological surface parameters (temperature, dew-point temperature, absolute humidity, relative humidity, horizontal visibility, sea-level pressure, wind speed, wind direction, cloudbase height, cloud cover, and Pasquill stability category) in each of 22 weather classes defined by obscuration type (such as rain, snow, and fog), visibility, absolute humidity, and cloud ceiling.

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1. Introduction

The meteorological database for 795 stations, provided by the U.S. Air Force Environmental Technical Applications Center at Scott Air Force Base, Illinois, was divided into 74 nonoverlapping climatic regions (1 in Southeast Asia; 3 each in Alaska, Central America, India, and Korea; 4 each in Central Europe and Mexico; 6 each in the Midwest and South America; 12 in Southern Europe; and 27 in Canada and the continental United States).

At most of these stations, observations were recorded every three hours for four periods during a standard day over approximately an 11-year period. These observations were used to compute the climatology data for each season for each of the 74 climatic regions. The recording period for each station contained consecutive years beginning no earlier than 1965 and ending no later than 1986. The climatology module CLIMAT contains conditional statistics based upon prevailing meteorological conditions. The seasons were determined from time changes in these conditional statistics.

1.1 Names of Things

There is one module, CLIMAT. It is composed of one subroutine, CLIMAT. No additional subroutines or functions are required for this module.

The PRECLI program must be executed to convert the 74 sequential CLIDATS data files to the 74 random access CLIDATR data files that CLIMAT processes. PRECLI is executed only once and the execution must precede the first use of the Electro-Optical Systems Atmospheric Effects Library (EOSAEL) with a call to CLIMAT.

The climatology data in the CLIDATR data files will be accessed by referencing input/output unit NCLIMT.

1.2 Availability

EOSAEL is available at no cost to U.S. Government agencies, specified allied organizations, and their authorized contractors. U.S. Government agencies needing EOSAEL should send a letter of request, signed by a branch chief or division director, to the U.S. Army Research Laboratory (ARL). Contractors should have their government contract monitor send the letter of request. Allied nation organizations must request EOSAEL

through their national representative. Please include, within security restrictions, a short description of your intended use(s).

Release of EOSAEL requires a memorandum of agreement (MOA) between ARL and the recipient's organization. We will send an MOA to you for signature. After you return it to us, we will sign it and return a copy of the MOA to you. EOSAEL is currently distributed through the DoD TECNET facility (Test and Evaluation Community Network); the TECNET system is located at Patuxent River, Maryland. If you do not already have an account on TECNET, we will sponsor an account for you and include an application for you to fill out. Once you return the application to ARL, we will complete the account application process for you. You will receive information about how to log onto the TECNET (through the Internet, or dial-up) directly from TECNET. If you need additional help locating or downloading EOSAEL files after you get your account, contact ARL.

On TECNET, the EOSAEL source code, DOS executables, and sample input and output files are available. Documentation for the modules is included as postscript files suitable for viewing or printing.

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2. Background

The CLIMAT module was developed to be used with EOSAEL and to provide the EOSAEL user with reasonable values of climatological variables for various land regions of the earth. Not all land areas are included in CLIMAT, and there is no plan for including all the land areas. CLIMAT was developed by Elton P. Avara and Bruce T. Miers of the U.S. Army Atmospheric Sciences Laboratory (ASL), White Sands Missile Range, NM.

The original module contained climatology data for only 10 regions in Central Europe [1] and the Mideast. CLIMAT has grown with each release of EOSAEL to the present 74 regions of the world.

2.1 General Climatology

The purpose of a climatological classification system is to obtain an efficient arrangement of information in a simplified and generalized form. Climatology data or statistics can be organized to describe the major types of climate in quantitative terms. No single classification can serve all purposes satisfactorily; therefore, many different schemes have been developed. Most climatic classifications are concerned with relationships between temperature, rainfall, and vegetation.

The meteorological measurements necessary to develop an electro-optical climatology are not made routinely, but are made at great expense (compared to routine meteorological measurements), at few locations, and over limited time intervals. Therefore, a climatological system must be developed from the data at hand and from the limited insight that the special measurements provide. Microphysical properties (e.g., composition, size distribution, and shape) of atmospheric aerosols must be inferred from visibility, weather obscuration type (such as rain, snow, and fog), and cloud information. The climatological areas presented in this report were developed with these criteria and subjective judgment.

A great deal of effort and investment has gone into creating the climatology for various regions of the world (fig. 1). We did studies for regions in the Mideast and South West Asia shown in figure 2 [2], Central America shown in figure 3 [3], Alaska shown in figure 4 [4], Korea shown in figure 5 [5], Mexico shown in figure 6 [6], Central and Northern Europe shown in figures 7 and 8 [7], India and Southeast Asia shown in figures 9 and 10 [8],

South America shown in figure 11 [9], and the Northern Mediterranean Area and Southern Europe shown in figure 7 [10]. Then we did climatology for the continental United States shown in figure 12 and for Canada shown in figure 13. Some regions of the world have not yet had climatologies produced.



Figure 1. Regions of world for which CLIMAT abstracts have been built.

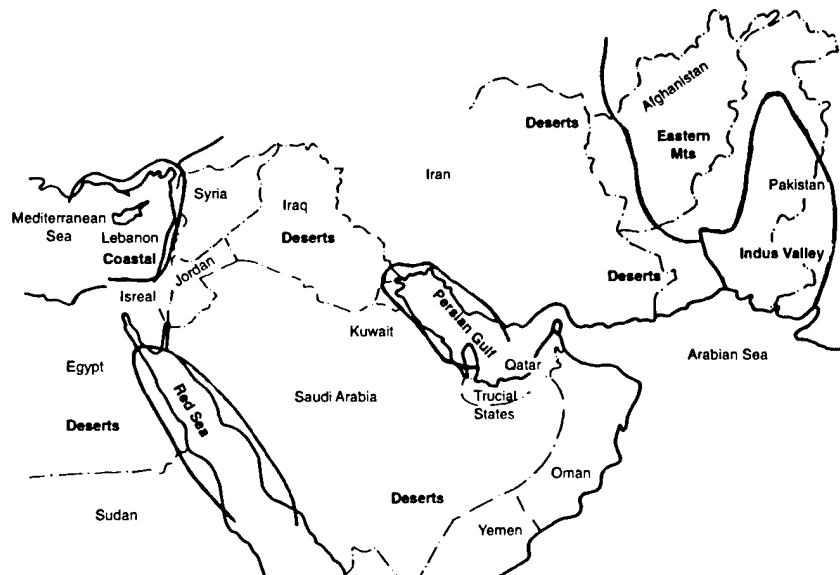


Figure 2. Regions in the Mideast.

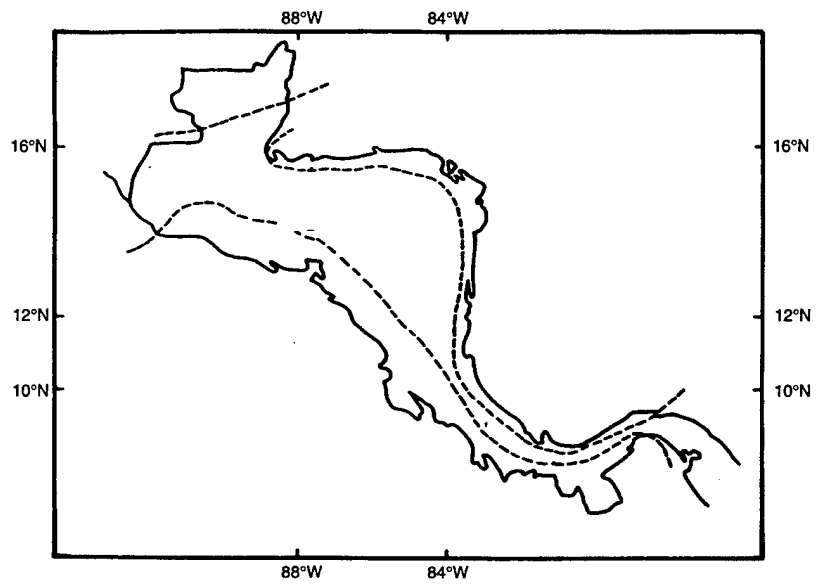


Figure 3. Regions in Central America.

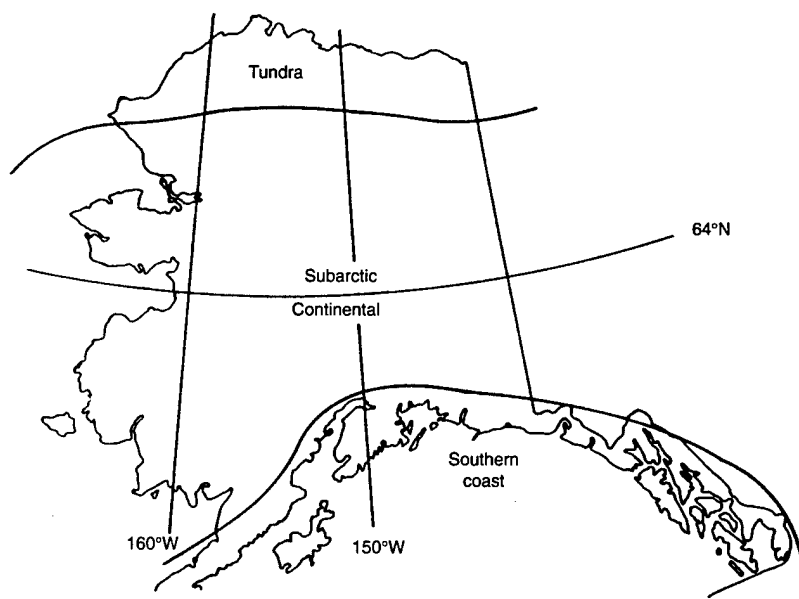


Figure 4. Regions in Alaska.

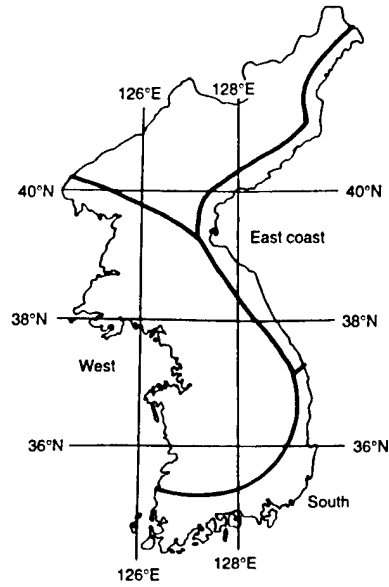


Figure 5. Regions in Korea.

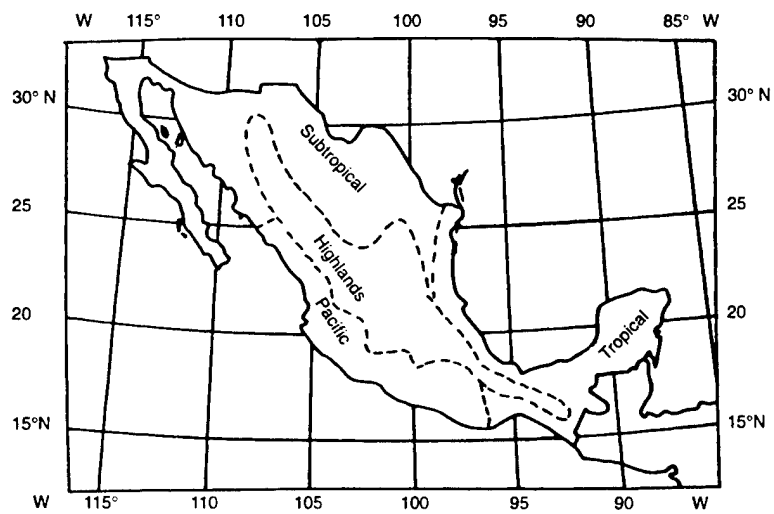


Figure 6. Regions in Mexico.

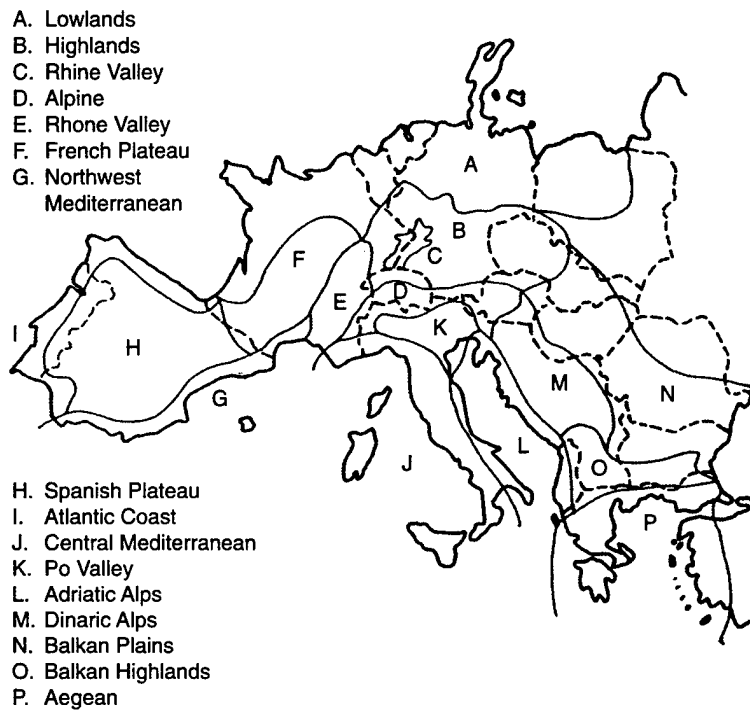


Figure 7. Regions in Europe.

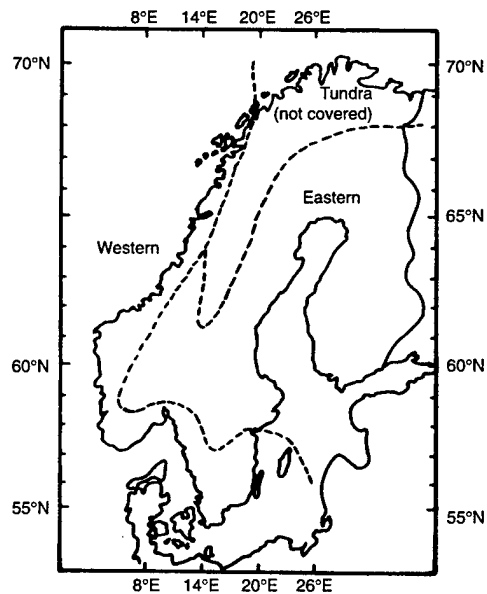


Figure 8. Regions in Scandinavia.

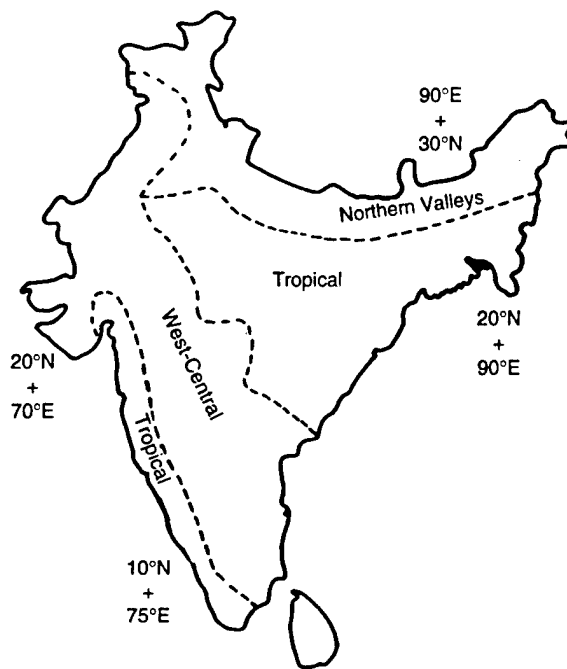


Figure 9. Regions in Indian subcontinent.

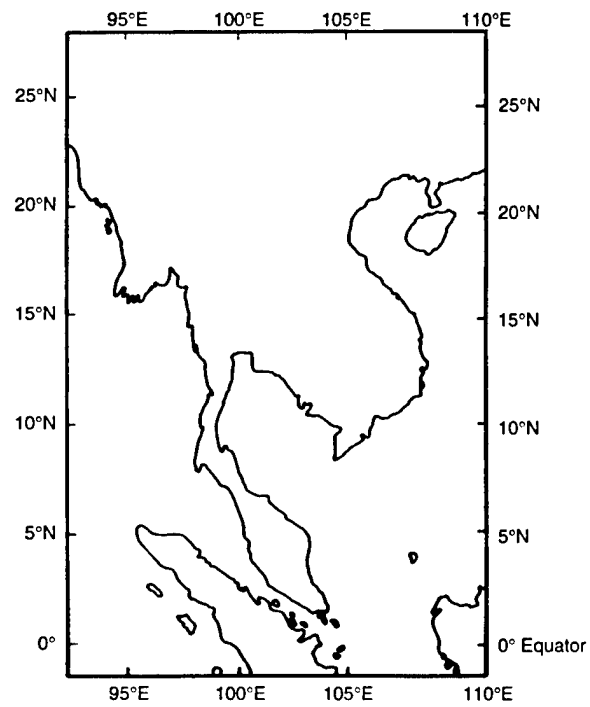


Figure 10. Region of Southeast Asia.

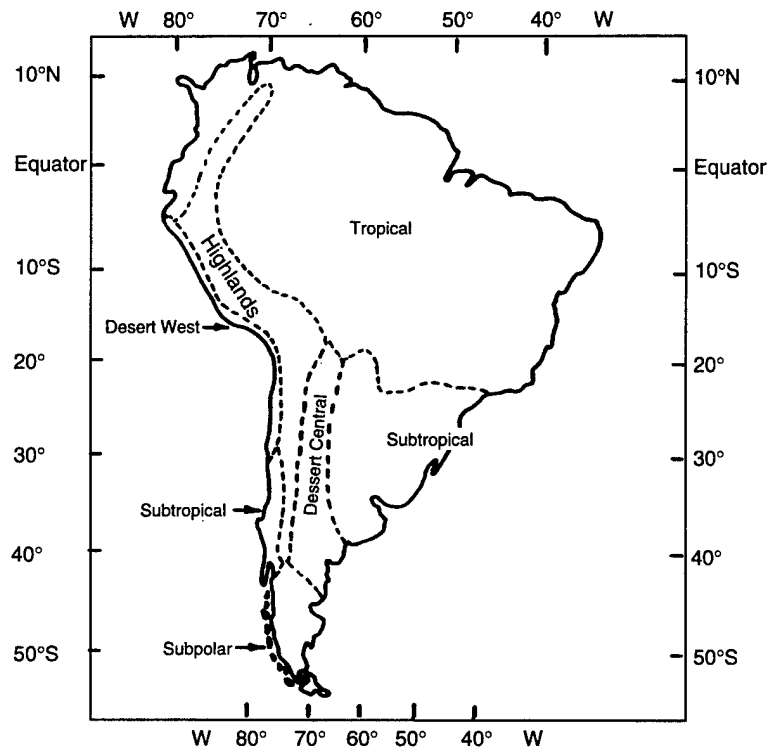


Figure 11. Regions in South America.

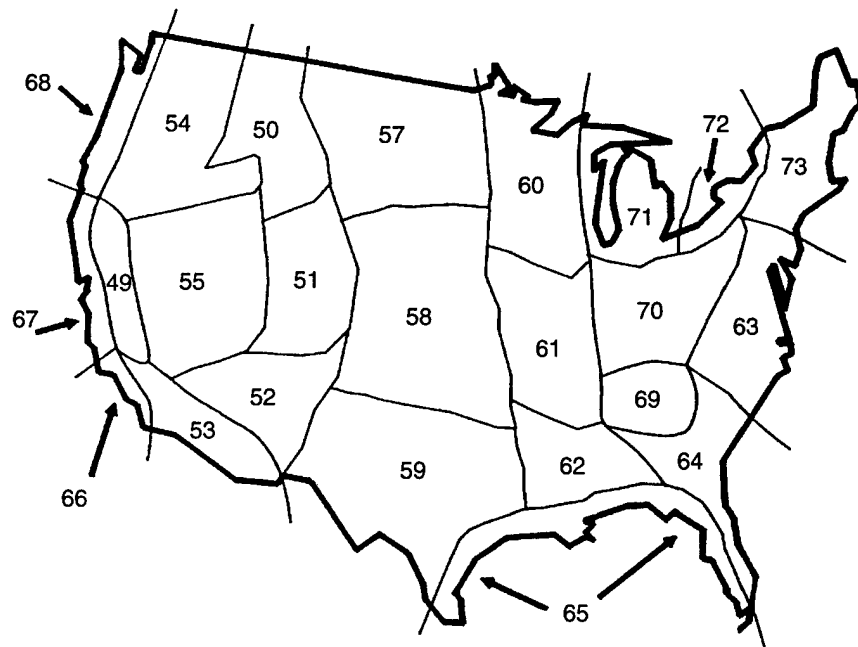


Figure 12. Regions in continental United States (see table 9 for names of regions).

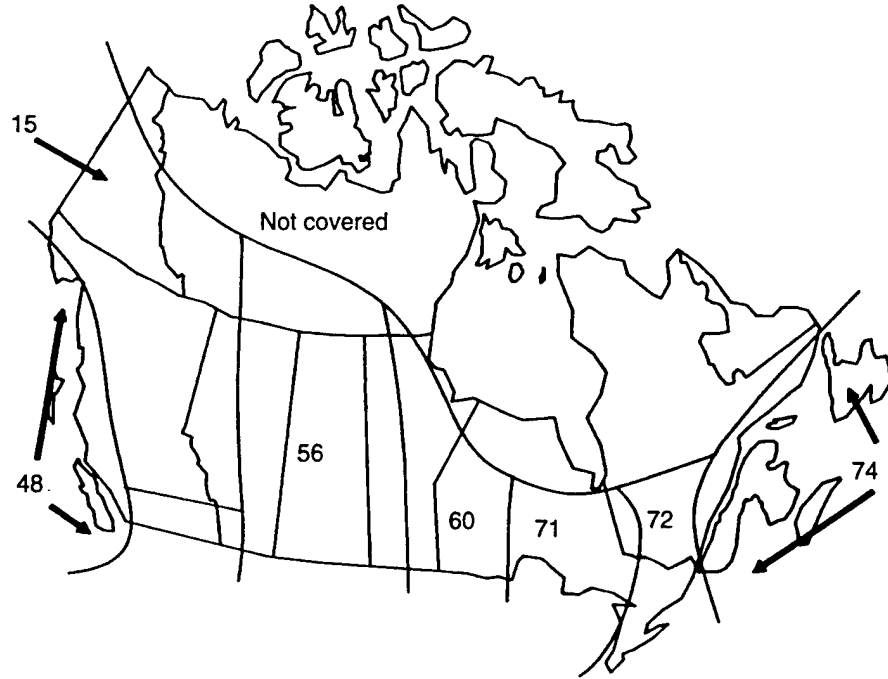


Figure 13. Regions in Canada (see table 9 for names of regions).

2.2 The CLIMAT Climatology Model

The CLIMAT model is based on conditional statistics or separate statistics for each of several meteorological conditions. Twenty-two meteorological conditions or classes were determined based upon obscuration type, visibility, ceiling height, and absolute humidity. Table 1 lists these classes.

The CLIMAT classes are not mutually exclusive for an observation could simultaneously include the report of fog, rain, and snow causing the observation to be counted in each of three classes. The 22 classes should not be combined as though they are independent to make new classes.

For each observation within each class, the meteorological parameters (temperature, dew point, absolute humidity, relative humidity, visibility, sea-level pressure, wind speed, wind direction, cloud height, cloud cover or amount, and Pasquill stability category) were used to compute climatological statistics (table 2) for four seasons and four time periods during the day (table 3) for each of the climatological regions (table 4). Table 5 presents the number of meteorological observations used within each season and each daily time period for each region.

The relative humidity R was computed from the equation

$$R = 100e(D)/e(T) , \quad (1)$$

Table 1. Meteorological condition classification

Class	Description
1	Fog, haze, and mist with visibility < 1 km.
2	Fog, haze, and mist with visibility ≥ 1 , < 3 km.
3	Fog, haze, and mist with visibility ≥ 3 , < 7 km.
4	Fog, haze, and mist with visibility ≥ 7 km.
5	Dust with visibility < 3 km.
6	Dust with visibility ≥ 3 km.
7	Drizzle, rain, and thunderstorms with visibility < 1 km.
8	Drizzle, rain, and thunderstorms with visibility ≥ 1 , < 3 km.
9	Drizzle, rain, and thunderstorms with visibility ≥ 3 , < 7 km.
10	Drizzle, rain, and thunderstorms with visibility ≥ 7 km.
11	Snow with visibility < 1 km.
12	Snow with visibility ≥ 1 , < 3 km.
13	Snow with visibility ≥ 3 , < 7 km.
14	Snow with visibility ≥ 7 km.
15	No sensible weather and absolute humidity < 10 g/m ³ .
16	No sensible weather and absolute humidity ≥ 10 g/m ³ .
17	Visibility < 1 km and ceiling height < 300 m.
18	Visibility < 3 km and ceiling height < 1000 m.
19	Ceiling height < 300 m.
20	Ceiling height < 1000 m.
21	No ceiling.
22	All conditions combined.

Warning: These classes are not mutually exclusive. They should not be combined to make new classes.

Table 2. CLIMAT meteorological parameters and statistics.

Meteorological parameter	Mean	Standard deviation	Percent occurrence
Temperature (C)	X	—	—
Dew-point (C)	X	—	—
Absolute humidity (g/m ³)	X	—	—
Relative humidity (%)	X	—	—
Visibility (km)	X	—	—
Sea-level pressure (mbar)	X	—	—
Wind speed (m/s)	X	X	—
Wind direction (30° intervals)	—	—	X
Cloud height (km)	X	—	—
Cloud cover (%)	X	X	—
Pasquill category (A-F)	—	—	X

where

T = the ambient temperature in degrees Kelvin

D = the dew-point temperature in degrees Kelvin

$e(X)$ = the vapor pressure in millibars,

with $X = D$ or T .

The vapor pressure is obtained from the equation [11]

$$\ln[e(X)/6.105] = 25.22(X - 273)/X - 5.31 \ln(X/273) . \quad (2)$$

The absolute humidity A was computed from the equation

$$A = 216.68e(D)/T . \quad (3)$$

The Pasquill stability category was obtained from a sequential procedure. The procedure starts with the calculation of the solar angle parameter S . Let A denote the solar angle in degrees above the horizon (negative if below the horizon) and S is determined by the inequalities,

$$A \leq 0 \mapsto S = 0, \quad (4)$$

$$0 < A \leq 15 \mapsto S = 1, \quad (5)$$

$$15 < A \leq 35 \mapsto S = 2, \quad (6)$$

$$35 < A \leq 60 \mapsto S = 3, \quad \text{and} \quad (7)$$

$$60 < A \leq 90 \mapsto S = 4, \quad (8)$$

Table 3. Time resolution of climatology model.

Daily period (all regions)		Local standard time (LST)			
Night		2000–0200			
Morning		0300–0900			
Day		1000–1400			
Afternoon		1500–1900			

Region	Season			
	Winter	Spring	Summer	Autumn
Central Europe	Nov–Feb	Mar–May	Jun–Aug	Sep–Oct
Mideast	Dec–Feb	Mar–May	Jun–Aug	Sep–Nov
Korea	Dec–Feb	Mar–May	Jun–Aug	Sep–Nov
Alaska	Nov–Mar	Apr–Apr	May–Sep	Oct–Oct
Scandinavia	Nov–Mar	Apr–Apr	May–Sep	Oct–Oct
Central America	Jan–Apr	May–May	Jun–Oct	Nov–Dec
Mexico	Jan–Feb	Mar–May	Jun–Oct	Nov–Dec
South America:				
Tropics, Desert West	May–Sep	Oct–Nov	Dec–Mar	Apr–Apr
Desert Central, Subtropic	Jun–Sep	Oct–Nov	Dec–Mar	Apr–May
Subpolar	May–Sep	Oct–Oct	Nov–Feb	Mar–Apr
Highlands	Jun–Aug	Sep–Nov	Dec–Mar	Apr–May
India	Dec–Jan	Feb–Apr	May–Sep	Oct–Nov
Southeast Asia	Nov–Mar	Apr–Apr	May–Sep	Oct–Oct
Southern Europe:				
French Plateau	Nov–Feb	Mar–May	Jun–Aug	Sep–Oct
All other regions	Dec–Feb	Mar–May	Jun–Aug	Sep–Nov
Canada and US	Dec–Feb	Mar–May	Jun–Aug	Sep–Nov

Table 4. Number of reporting stations within each climatological region.

World region	Climatology region	Station	World region	Climatology region	Station
Central Europe	Lowlands	36	Southern Europe	Adriatic Alps	14
	Rhine Valley	7		Aegean	9
	Highlands	27		Balkan Highlands	9
Mideast	Alpine	5	Canada and US	Balkan Plains	20
	Deserts	53		Dinaric Alps	10
	Coastal	11		Po Valley	5
	Persian Gulf	6		Central Mediterranean	12
	Red Sea	6		Rhone Valley	5
	Eastern Mountains	10		French Plateau	9
Korea	Indus Valley	12		Northwest Mediterranean	5
	East Coast	4		Spanish Plateau	6
	South	4		Atlantic Coast	7
Alaska	West	11		Western Canada	5
	Tundra	6		Sacramento Valley	6
	Subarctic Continental	25		Northern Rocky Mountains	10
Scandinavia	Southern Coast	6		Central Rocky Mountains	7
	Western	11		Southern Rocky Mountains	4
Central America	Eastern	4		Southwestern Desert	8
	Pacific Side	8		Northern Inter-Mountain	5
Mexico	Interior	3		Southern Inter-Mountain	8
	Atlantic Side	6		Canadian Prairie	5
	Subtropical	7		Northern Great Plains	10
	Pacific	4		Central Great Plains	10
Southeast Asia	Highlands	8		Southern Great Plains	11
	Tropical	10		Upper Mississippi Valley	10
South America	Southeast Asia	14		Middle Mississippi Valley	10
	Tropics	29		Lower Mississippi Valley	10
India	Desert West	11		Middle Atlantic Coast	14
	Desert Central	13		Southern Atlantic Coast	18
	Subtropics	12		Gulf Coast	21
	Subpolar	9		Southern Pacific Coast	4
	Highlands	10		Central Pacific Coast	7
	West-Central	8		Northern Pacific Coast	12
	Northern Valleys	5		Tennessee Valley	7
	Tropical	17		Ohio Valley	14
				Great Lakes	15
				Eastern Great Lakes	14
				Northern Atlantic Coast	11
				Canadian Atlantic Region	10

with A computed for the station latitude and longitude and the time of day and Julian date for each observation.

The next step in the procedure calculates the net radiative index N_{RI} . Let C denote the cloud cover in octants or eighths, H denote the cloudbase height in hundreds of feet, and $N_{RI} \in [1, \dots, 7]$. The N_{RI} was determined by the values of C , H , A , and S according to the conditions in table 6.

The value of $C = 9$ or 10 denotes an obscured sky. Given $C = 8$, $H > 7$, and $A > 0$, 1 was added to the N_{RI} obtained above. Next, when $A > 0$ and $N_{RI} > 4$, N_{RI} was set equal to 4 [12].

Let V denote the wind speed in knots. The Pasquill stability category was obtained from table 7 and the value of N_{RI} .

The CLIMAT module contains a complete climatology model for each of the four seasons, four time periods of the day, and each of the 74 regions. This model contains statistics for the data elements described for any of the 22 meteorological classes listed in table 1.

Table 5: Number of observations in each region.

Season	Time of day (LST)				Time of day (LST)			
	20-02	03-09	10-14	15-19	20-02	03-09	10-14	15-19
Europe Lowlands					Europe Rhine Valley			
Winter	83,385	83,675	84,041	83,895	16,305	16,552	16,851	16,789
Spring	64,126	64,665	64,970	64,516	12,302	12,543	12,708	12,759
Summer	64,342	64,464	64,312	64,300	11,950	12,242	12,505	12,559
Autumn	43,230	43,266	43,323	43,311	7,874	8,038	8,346	8,346
Europe Highlands					Europe Alpine			
Winter	59,138	61,937	64,291	63,677	7,897	9,569	11,159	11,125
Spring	44,857	47,297	49,459	48,893	6,030	7,208	8,573	8,437
Summer	44,241	46,535	48,660	48,101	6,094	7,368	8,630	8,600
Autumn	29,340	30,866	32,542	32,343	4,109	4,962	5,811	5,786
Mideast Deserts					Mideast Coastal			
Winter	54,532	50,579	52,105	38,247	20,640	15,287	19,345	8,262
Spring	61,314	58,108	56,066	43,291	21,789	16,560	20,426	9,072
Summer	60,507	58,457	54,808	42,598	21,004	16,487	19,992	8,759
Autumn	56,584	54,581	53,971	41,043	20,387	15,730	19,537	8,450
Mideast Persian Gulf					Mideast Red Sea			
Winter	4,689	7,320	4,484	6,262	6,619	6,895	5,999	4,111
Spring	5,186	7,864	4,515	6,723	7,487	8,037	6,772	4,815
Summer	5,390	8,179	4,358	6,715	7,295	8,109	6,505	4,842
Autumn	4,816	7,860	4,465	6,565	6,720	7,389	6,178	4,526
Mideast Eastern Mountains					Mideast Indus Valley			
Winter	2,518	3,536	4,087	2,951	4,067	5,406	6,167	3,172
Spring	2,498	3,086	3,510	2,842	4,166	5,756	5,755	3,123
Summer	2,923	3,181	3,642	2,819	5,057	6,004	5,957	3,210
Autumn	2,897	3,342	3,780	3,157	4,741	5,734	5,739	3,198
Korean East Coast					South Korea			
Winter	7,259	11,213	3,772	7,643	5,507	8,538	3,275	6,510
Spring	7,927	11,837	3,851	8,037	5,681	8,926	3,505	7,006
Summer	7,906	11,846	3,858	8,006	5,883	9,049	3,543	7,083
Autumn	7,694	11,707	3,940	7,962	5,699	8,833	3,488	7,178
West Korea					Alaskan Tundra			
Winter	17,362	27,904	9,776	18,797	18,246	14,554	15,350	7,940
Spring	17,772	28,776	10,113	19,510	3,737	2,993	3,057	1,674
Summer	17,948	29,057	10,272	19,520	19,010	14,903	15,402	8,571
Autumn	17,449	28,112	10,091	19,141	3,765	3,020	3,162	1,716

Table 5: Number of observations in each region (cont'd).

Season	Time of day (LST)				Time of day (LST)			
	20-02	03-09	10-14	15-19	20-02	03-09	10-14	15-19
Alaskan Subarctic Continent					Alaskan Southern Coast			
Winter	10,7147	83,486	94,265	45,866	13,039	11,747	13,096	8,028
Spring	2,1894	16,965	18,657	9,336	2,693	2,363	2,647	1,583
Summer	11,2699	90,078	94,796	47,047	13,410	11,572	13,078	7,856
Autumn	2,2600	18,303	19,353	9,698	2,750	2,413	2,630	1,625
Western Scandinavia					Eastern Scandinavia			
Winter	16,326	18,135	21,135	20,333	12,948	9,436	9,471	5,920
Spring	3,290	3,710	4,272	4,141	2,613	1,898	1,892	1,179
Summer	16,833	18,949	21,837	21,074	13,058	9,551	9,566	5,987
Autumn	3,345	3,735	4,322	4,189	2,698	1,965	1,961	1,235
Central America Pacific					Central America Interior			
Winter	8,699	13,216	6,363	10,945	1,684	2,701	1,165	2,381
Spring	2,362	3,529	1,705	2,869	443	753	329	652
Summer	11,951	17,800	8,309	14,573	2,770	4,155	1,735	3,756
Autumn	4,589	6,864	3,259	5,564	943	1,519	632	1,290
Central America Atlantic					Mexico Subtropical			
Winter	2,171	5,244	3,773	5,556	2,595	4,881	2,634	5,067
Spring	645	1,513	1,029	1,513	4,132	7,401	4,034	7,723
Summer	3,514	7,693	4,977	7,596	6,898	13,257	7,261	14,035
Autumn	1,364	2,898	1,955	2,939	2,493	4,789	2,676	50,81
Mexico Pacific					Mexico Highlands			
Winter	1,894	2,937	1,357	2,542	1,867	3,117	2,525	3,113
Spring	2,968	4,620	2,183	3,926	2,919	5,012	3,938	4,910
Summer	5,070	8,012	3,740	6,950	5,132	8,578	6,481	8,108
Autumn	1,962	3,154	1,486	2,691	2,020	3,203	2,608	3,262
Mexico Tropical					S. America Tropics			
Winter	1,875	6,484	4,059	7,064	25,400	44,253	40,447	45,291
Spring	2,991	10,425	6,278	10,736	10,403	18,329	16,287	18,229
Summer	5,699	17,784	10,306	17,731	19,901	34,803	31,387	34,527
Autumn	2,180	6,534	4,107	6,991	5,127	8,704	7,922	8,830
S. America Desert West					S. America Desert Central			
Winter	24,569	22,567	25,877	17,681	15,088	24,295	9,067	21,039
Spring	10,266	9,732	10,398	7,344	7,919	12,884	4,666	10,527
Summer	18,542	17,494	19,168	13,223	14,165	23,709	8,912	20,342
Autumn	4,853	4,346	4,933	3,404	7,580	12,464	4,582	10,563

Table 5: Number of observations in each region (cont'd).

Season	Time of day (LST)				Time of day (LST)			
	20-02	03-09	10-14	15-19	20-02	03-09	10-14	15-19
South America Subtropics					South America Subpolar			
Winter	16,289	22,113	16,274	16,527	8,680	12,225	8,875	8,316
Spring	8,386	12,018	8,115	8,349	2,080	2,895	1,848	1,817
Summer	16,081	22,660	15,501	15,942	7,244	10,228	6,661	6,479
Autumn	8,276	11,124	7,862	8,166	3,423	4,731	3,376	3,187
South America Highlands					India West-Central			
Winter	5,892	9,373	13,162	11,061	5,272	7,547	3,306	6,123
Spring	6,384	9,916	13,288	11,606	8,019	11,594	4,873	8,973
Summer	7,910	12,483	17,130	14,785	13,578	19,362	7,849	14,852
Autumn	4,119	6,415	8,916	7,594	5,262	7,336	3,161	5,970
India Northern Valleys					India Tropical			
Winter	2,494	3,816	1,681	3,048	13,384	18,811	7,901	15,272
Spring	3,862	5,782	2,448	4,557	20,180	28,336	11,552	22,374
Summer	6,480	9,882	3,959	7,467	33,868	47,877	18,589	36,406
Autumn	2,544	3,777	1,670	3,060	13,428	18,335	7,752	15,030
Southeast Asia					European Adriatic Alps			
Winter	25,642	25,824	32,054	31,380	15,323	14,172	14,946	13,023
Spring	5,097	5,212	6,006	5,942	15,971	14,942	15,426	13,603
Summer	25,843	26,905	31,660	31,017	16,445	15,534	16,063	13,981
Autumn	5,342	5,381	6,438	6,286	16,118	14,990	15,992	13,720
European Aegean					European Balkan Highlands			
Winter	15,386	9,934	10,572	5,243	11,359	9,601	10,052	6,339
Spring	15,200	10,047	10,726	5,344	11,229	9,755	10,101	6,476
Summer	15,253	10,284	11,185	5,470	12,168	10,609	10,732	6,824
Autumn	15,952	10,656	11,520	5,634	12,043	10,160	10,738	6,685
European Balkan Plains					European Dinaric Alps			
Winter	29,813	23,785	24,093	17,534	12,300	11,135	11,450	9,155
Spring	29,021	23,551	23,929	17,387	12,235	11,356	11,653	9,353
Summer	30,914	25,000	25,536	18,468	12,770	11,332	11,730	9,067
Autumn	31,245	24,996	25,290	18,274	12,856	11,516	11,840	9,442
European Po Valley					European Central Medit.			
Winter	5,004	5,430	5,662	5,715	13,620	14,303	15,419	15,183
Spring	4,964	5,654	5,919	5,874	13,482	14,350	15,375	15,085
Summer	5,150	6,044	6,531	6,391	14,668	15,594	16,647	16,282
Autumn	5,479	5,968	6,218	6,251	14,252	15,239	16,370	15,994

Table 5: Number of observations in each region (cont'd).

Season	Time of day (LST)				Time of day (LST)			
	20-02	03-09	10-14	15-19	20-02	03-09	10-14	15-19
European Rhone Valley					European French Plateau			
Winter	6,519	6,526	6,544	6,556	14,319	17,681	20,890	19,718
Spring	6,689	6,700	6,718	6,712	10,792	13,330	15,503	14,497
Summer	6,646	6,648	6,679	6,680	10,955	13,308	15,539	14,116
Autumn	6,547	6,601	6,603	6,605	7,390	9,027	10,557	9,790
European NW Mediterranean					European Spanish Plateau			
Winter	3,910	5,481	5,029	6,114	4,277	6,870	7,865	8,303
Spring	4,111	5,880	5,255	6,478	4,367	7,263	8,070	8,642
Summer	3,629	5,185	4,584	5,723	3,941	6,462	6,963	7,474
Autumn	3,637	5,088	4,519	5,558	3,928	6,355	7,030	7,596
European Atlantic Coast					Western Canada			
Winter	6,447	9,117	7,061	8,662	11,508	10,948	9,512	8,257
Spring	6,870	9,615	7,359	9,079	11,749	11,131	9,678	8,373
Summer	6,107	8,579	6,524	7,959	11,727	11,291	9,737	8,486
Autumn	6,206	8,611	6,583	8,161	11,620	11,215	9,675	8,468
Sacramento Valley					North Rocky Mountains			
Winter	11,440	12,203	13,605	13,564	23,891	17,881	18,099	10,138
Spring	11,485	12,446	13,868	13,794	24,102	18,384	18,693	10,446
Summer	10,764	12,183	13,689	13,710	23,000	17,898	18,289	10,308
Autumn	10,960	12,187	13,673	13,713	23,100	17,566	17,922	10,131
Central Rocky Mountains					South Rocky Mountains			
Winter	20,797	14,050	14,132	6,992	7,509	6,008	7,341	3,291
Spring	21,053	14,334	14,489	7,129	7,817	6,192	7,502	3,408
Summer	20,977	14,436	14,493	7,090	7,928	6,284	7,621	3,392
Autumn	20,775	14,180	14,283	7,041	7,817	6,123	7,414	3,384
Southwestern Desert					North Inter-Mountain			
Winter	17,170	14,377	18,056	12,524	9,168	9,161	9,151	9,127
Spring	17,294	14,915	18,627	12,770	9,339	9,319	9,385	9,323
Summer	16,994	15,075	18,560	12,295	9,296	9,283	9,292	9,347
Autumn	17,025	14,755	18,341	12,272	9,188	9,124	9,189	9,234
South Inter-Mountain					Canadian Prairie			
Winter	23,394	16,047	17,136	8,514	14,152	12,604	8,814	7,295
Spring	23,821	16,762	17,866	8,793	14,391	12,713	8,974	7,396
Summer	23,453	16,973	17,679	8,797	14,456	12,902	9,045	7,478
Autumn	23,212	16,387	17,315	8,651	14,397	12,855	8,978	7,457

Table 5: Number of observations in each region (cont'd).

Season	Time of day (LST)				Time of day (LST)			
	20-02	03-09	10-14	15-19	20-02	03-09	10-14	15-19
Northern Great Plains					Central Great Plains			
Winter	25,946	26,964	15,375	16,358	25,528	27,929	15,387	17,850
Spring	26,337	27,154	15,678	16,501	26,046	28,459	15,790	18,226
Summer	26,699	27,660	15,827	16,848	26,122	28,694	15,657	18,206
Autumn	26,467	27,402	15,667	16,664	26,053	28,457	15,632	18,068
Southern Great Plains					Upper Mississippi Valley			
Winter	25,287	37,927	12,689	25,257	15,847	28,272	10,697	20,474
Spring	25,842	38,515	12,977	25,779	16,159	28,656	11,002	20,489
Summer	25,977	38,771	13,007	25,895	15,899	28,457	10,907	19,867
Autumn	25,691	38,369	12,908	25,604	15,765	28,284	10,847	20,095
Middle Mississippi Valley					Lower Mississippi Valley			
Winter	21,954	33,124	11,187	22,265	17,385	27,941	9,876	19,685
Spring	22,313	33,431	11,365	22,489	17,624	28,379	10,076	19,783
Summer	22,363	33,559	11,348	22,644	17,612	28,143	9,947	19,619
Autumn	22,314	33,430	11,339	22,485	17,533	28,003	9,915	19,741
Middle Atlantic Coast					South Atlantic Coast			
Winter	25,400	25,475	27,607	27,133	37,238	37,377	37,600	37,551
Spring	25,853	26,135	28,385	27,812	37,999	37,992	38,315	38,239
Summer	25,536	26,492	28,267	27,732	38,168	38,175	38,235	38,442
Autumn	25,519	26,004	28,026	27,495	37,568	37,460	37,852	37,822
Gulf Coast					Southern Pacific Coast			
Winter	42,861	60,030	28,689	45,236	4,083	4,179	5,733	5,081
Spring	43,413	61,046	29,181	45,939	4,089	4,497	5,837	5,097
Summer	43,197	61,004	28,980	45,944	4,135	4,957	5,833	5,147
Autumn	42,994	60,234	28,722	45,555	4,128	4,684	5,850	5,206
Central Pacific Coast					Northern Pacific Coast			
Winter	8,753	8,524	11,980	10,110	21,642	21,829	22,138	21,908
Spring	9,239	9,530	12,756	10,677	22,218	22,349	22,636	22,406
Summer	8,841	9,592	12,535	10,250	21,893	22,037	22,479	22,391
Autumn	8,403	8,926	12,025	9,962	21,680	21,817	22,091	22,048
Tennessee Valley					Ohio Valley			
Winter	13,846	19,755	8,076	13,872	30,243	37,051	25,138	31,894
Spring	14,234	20,154	8,276	14,159	30,758	37,558	25,687	32,409
Summer	14,214	20,093	8,211	14,138	30,517	37,630	25,460	32,432
Autumn	13,981	19,727	8,095	13,889	30,351	37,296	25,273	32,111

Table 5: Number of observations in each region (cont'd).

Season	Time of day (LST)				Time of day (LST)			
	20-02	03-09	10-14	15-19	20-02	03-09	10-14	15-19
Great Lakes					Eastern Great Lakes			
Winter	34,211	38,705	29,684	34,219	24,081	24,537	26,935	26,620
Spring	34,913	39,381	30,306	34,837	24,245	25,270	27,657	27,127
Summer	34,930	39,565	30,181	34,949	23,626	25,709	27,737	26,916
Autumn	34,660	39,286	29,938	34,612	23,618	25,025	27,211	26,493
North Atlantic Coast					Canadian Atlantic Region			
Winter	22,751	23,240	24,799	24,860	17,601	12,851	13,031	6,379
Spring	23,147	23,456	25,231	25,237	17,816	12,998	13,335	6,449
Summer	23,191	23,617	25,047	25,210	17,602	12,966	13,215	6,390
Autumn	23,101	23,470	25,053	25,111	17,515	12,898	13,077	6,270

Table 6. Net radiative index as a function of cloud cover (C), cloudbase height (H), solar angle (A), and solar angle parameter (S).

C	H	A	N_{RI}
9-10	All	All	5
8	<7	All	5
8	≥ 7	≤ 0	6
4-7	All	≤ 0	6
0-3	All	≤ 0	7
0-4	All	>0	5 - S
5-7	<7	>0	7 - S
5-8	7-16	>0	6 - S
5-8	>16	>0	5 - S

Table 7. Pasquill stability category (A-F) as a function of the wind speed (V) in knots and net radiative index.

Windspeed			Net radiative index						
			1	2	3	4	5	6	7
$0 \leq V$	< 2		A	A	B	C	D	F	F
$2 \leq V$	< 4		A	B	B	C	D	F	F
$4 \leq V$	< 6		A	B	C	D	D	E	F
$6 \leq V$	< 7		B	B	C	D	D	E	F
$7 \leq V$	< 8		B	B	C	D	D	D	E
$8 \leq V$	< 10		B	C	C	D	D	D	E
$10 \leq V$	< 11		C	C	D	D	D	D	E
$11 \leq V$	< 12		C	C	D	D	D	D	D
$12 \leq V$	--		C	D	D	D	D	D	D

3. Caveats

3.1 Grade of Software

The CLIMAT module is considered to be fieldable. It is a collection of means, standard deviations, and percentage occurrences of actual weather observations. All available observations in the ASL climate database were candidates for inclusion in the module. For the regions that had observations available from numerous stations, only the observations from stations with the most consistent data and longer periods of record were used. Editing of the data was performed. There is a high probability that some bogus values were used in the calculations. The values in CLIMAT compare well with other comparable published data. The data used in developing CLIMAT have been used by numerous Army agencies for the past 12 years in studies and evaluations of systems and war games.

3.2 Module Failure

The CLIMAT module should not fail to return values. There is an inherent risk that the user may inadvertently ask for climatology statistics for a heavy snow condition in the Mideast deserts in July when such an occurrence would be rare. In such a case, the model should return zeros for all output variables.

3.3 Verification Tests

No formal documented verification tests of the CLIMAT module exists.

4. Operations Guide

4.1 Input

When the CLIMAT module is called, all other EOSAEL modules will subsequently use the supplied meteorological data from CLIMAT, superseding any meteorological data that may have been inputted into a specific module.

The data input to CLIMAT is a single data statement, read by the EOEXEC routine, under the common format (A4,6X,7E10-4). The identifier is CLIM. Table 8 gives the variables and descriptions.

Table 8. Description of input parameters for CLIMAT.

Variable	Description
ICLMAT	Flag denoting either climatology input from CLIMAT (ICLMAT = 1.0) or user input of data (ICLMAT = 2.0).
LOCAT	The region indicator, 1 to 74, of which the values refer to the IDs (identifications) given in table 9 or 10.
MONTH	A value, 1.0 to 12.0, indicating month and used to determine the season.
NHOUR	A value, 0.0 to 23.0, indicating time of day and used to select one of four time periods of the day, 20-02, 03-09, 10-14, and 15-19.
ICLASS	The climatology class number (see table 1). The default value is 22. If ICLASS = 0.0 (and NPRT > 0.0), the statistics for all 22 classes will be printed and the values for ICLASS = 22.0 will be returned in the "CALL CLIMAT" statement.
NPRT	The print selector of which: NPRT ≤ 0.0 indicates no printing of climatology data. NPRT > 0.0 indicates printing of all available means, standard deviations, and percentage occurrences for the chosen ICLASS.

Table 9. Identification number and its region.

ID	Region	ID	Region
1.	European Lowlands	38.	European Balkan Highlands
2.	European Rhine Valley	39.	European Balkan Plains
3.	European Highlands	40.	European Dinaric Alps
4.	European Alpine	41.	European Po Valley
5.	Mideast Deserts	42.	European Central Mediterranean
6.	Mideast Coastal	43.	European Rhone Valley
7.	Mideast Persian Gulf	44.	European French Plateau
8.	Mideast Red Sea	45.	European NW Mediterranean
9.	Mideast Eastern Mountains	46.	European Spanish Plateau
10.	Mideast Indus Valley	47.	European Atlantic Coast
11.	Korean East Coast	48.	Western Canada
12.	South Korea	49.	Sacramento Valley
13.	West Korea	50.	Northern Rocky Mountains
14.	Alaskan Tundra	51.	Central Rocky Mountains
15.	Alaskan Subarctic Continental	52.	Southern Rocky Mountains
16.	Alaskan Southern Coast	53.	Southwestern Desert
17.	Western Scandinavia	54.	Northern Inter-Mountain
18.	Eastern Scandinavia	55.	Southern Inter-Mountain
19.	Central America Pacific Side	56.	Canadian Prairie
20.	Central American Interior	57.	Northern Great Plains
21.	Central America Atlantic Side	58.	Central Great Plains
22.	Mexico Subtropical	59.	Southern Great Plains
23.	Mexico Pacific	60.	Upper Mississippi Valley
24.	Mexico Highlands	61.	Middle Mississippi Valley
25.	Mexico Tropical	62.	Lower Mississippi Valley
26.	South America Tropics	63.	Middle Atlantic Coast
27.	South America Desert West	64.	Southern Atlantic Coast
28.	South America Desert Central	65.	Gulf Coast
29.	South America Subtropics	66.	Southern Pacific Coast
30.	South America Subpolar	67.	Central Pacific Coast
31.	South America Highlands	68.	Northern Pacific Coast
32.	India West-Central	69.	Tennessee Valley
33.	India Northern Valleys	70.	Ohio Valley
34.	India Tropical	71.	Great Lakes
35.	Southeast Asia	72.	Eastern Great Lakes
36.	European Adriatic	73.	Northern Atlantic Coast
37.	European Aegean	74.	Canadian Atlantic Region

Table 10. Region and its identification number.

Region	ID	Region	ID
Alaskan Southern Coast	16.	Mexico Pacific	23.
Alaskan Subarctic Continental	15.	Mexico Subtropical	22.
Alaskan Tundra	14.	Mexico Tropical	25.
Canadian Atlantic Region	74.	Middle Atlantic Coast	63.
Canadian Prairie	56.	Middle Mississippi Valley	61.
Central America Atlantic Side	21.	Mideast Coastal	6.
Central America Pacific Side	19.	Mideast Deserts	5.
Central American Interior	20.	Mideast Eastern Mountains	9.
Central Great Plains	58.	Mideast Indus Valley	10.
Central Pacific Coast	67.	Mideast Persian Gulf	7.
Central Rocky Mountains	51.	Mideast Red Sea	8.
Eastern Great Lakes	72.	Northern Atlantic Coast	73.
Eastern Scandinavia	18.	Northern Great Plains	57.
European Adriatic	36.	Northern Inter-Mountain	54.
European Aegean	37.	Northern Pacific Coast	68.
European Alpine	4.	Northern Rocky Mountains	50.
European Atlantic Coast	47.	Ohio Valley	70.
European Balkan Highlands	38.	Sacramento Valley	49.
European Balkan Plains	39.	South America Desert Central	28.
European Central Mediterranean	42.	South America Desert West	27.
European Dinaric Alps	40.	South America Highlands	31.
European French Plateau	44.	South America Subpolar	30.
European Highlands	3.	South America Subtropics	29.
European Lowlands	1.	South America Tropics	26.
European NW Mediterranean	45.	South Korea	12.
European Po Valley	41.	Southeast Asia	35.
European Rhine Valley	2.	Southern Atlantic Coast	64.
European Rhone Valley	43.	Southern Great Plains	59.
European Spanish Plateau	46.	Southern Inter-Mountain	55.
Great Lakes	71.	Southern Pacific Coast	66.
Gulf Coast	65.	Southern Rocky Mountains	52.
India Northern Valleys	33.	Southwestern Desert	53.
India Tropical	34.	Tennessee Valley	69.
India West-Central	32.	Upper Mississippi Valley	60.
Korean East Coast	11.	West Korea	13.
Lower Mississippi Valley	62.	Western Canada	48.
Mexico Highlands	24.	Western Scandinavia	17.

4.2 Output

Eleven output quantities are available from CLIMAT:

TEMP	Mean temperature (degrees Celsius)
PRESS	Mean sea-level pressure (millibars)
RH	Mean relative humidity (percent)
AH	Mean absolute humidity (grams per cubic meter)
DP	Mean dew-point temperature (degrees Celsius)
VIS	Mean horizontal visibility (kilometers)
WNDVEL	Mean wind speed (meters per second)
WINDIR	Most probable wind direction (degrees), given in 30° increments (015, 045, 075, ..., 345)
IPASCT	An indicator (1–6) for the most probable Pasquill stability category (A–F)
CLDHT	Mean cloud height (kilometers)
CLDCVR	Mean total cloud cover (percent)

5. Sample Runs

5.1 Overview

This section describes the two samples of input and output files supplied with the CLIMAT module. Sample 1 is typical of many new users' first questions. Sample 2 shows the more complete examination of the weather to see the "big picture" better.

5.2 Sample 1

Sample 1 is an attempt to answer the question that many users ask: What happens when it rains?

5.2.1 Input File CLIMAT01.DAT

CLIMAT01.DAT is an input file that might be used to plan a July 4th picnic in Washington, D.C. The first line, labeled "WAVL," has the wavelength of interest. This is always required for EOSAEL, though the CLIMAT module does not use it.

```
WAVL      10.591
CLIMAT      1.0      63.0      7.0      16.0      0.0      1.0
STOP
# THE FOLLOWING IS EOSAEL SOURCE CONTROL INFORMATION
# YOU CAN SAFELY REMOVE IT
# SCCS  @(#) CLIMAT02.DAT 2.1 02/23/90
```

5.2.2 Output File CLIMAT01.OUT

The output file from the CLIMAT01.OUT file follows.

```

*****
WARNING - THIS LIBRARY CONTAINS TECHNICAL DATA WHOSE EXPORT IS RESTRICTED
BY THE ARMS EXPORT CONTROL ACT (TITLE 22, U.S.C., SEC 2751 ET SEQ.) OR
EXECUTIVE ORDER 12470. VIOLATION OF THESE EXPORT LAWS ARE SUBJECT TO
SEVERE CRIMINAL PENALTIES.
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*****
*                               *
*   ELECTRO-OPTICAL SYSTEMS   *
*                               *
*   ATMOSPHERIC EFFECTS LIBRARY *
*                               *
*   NOT FOR OPERATIONAL USE    *
*                               *
*   EOSAEL92 REV 2.2   03/07/91 *
*                               *
*****

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WAVL 10.591

NOTE: THAT THE ABOVE CARD WAS MODIFIED FOR CONSISTENCY TO:

WAVL .1059E+02 .1059E+02 .0000E+00

1

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*****
*                               *
*   C L I M A T               *
*                               *
*   CLIMATOLOGY               *
*   MODULE                    *
*   NOT FOR OPERATIONAL USE    *
*                               *
*   EOSAEL92 REV 1.5   04/03/91 *
*                               *
*****

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CLIMATOLOGY MODEL

DEFINITIONS OF METEOROLOGICAL CLASSES

CLASS 1 = FOG, HAZE AND MIST WITH VIS LT 1 KM.
 CLASS 2 = FOG, HAZE AND MIST WITH VIS GE 1, LT 3 KM.
 CLASS 3 = FOG, HAZE AND MIST WITH VIS GE 3, LT 7 KM.
 CLASS 4 = FOG, HAZE AND MIST WITH VIS GE 7 KM.
 CLASS 5 = DUST WITH VIS LT 3 KM.
 CLASS 6 = DUST WITH VIS GE 3 KM.
 CLASS 7 = DRIZZLE, RAIN AND TSTMS WITH VIS LT 1 KM.
 CLASS 8 = DRIZZLE, RAIN AND TSTMS WITH VIS GE 1, LT 3 KM.
 CLASS 9 = DRIZZLE, RAIN AND TSTMS WITH VIS GE 3, LT 7 KM.
 CLASS 10 = DRIZZLE, RAIN AND TSTMS WITH VIS GE 7 KM.
 CLASS 11 = SNOW WITH VIS LT 1 KM.
 CLASS 12 = SNOW WITH VIS GE 1, LT 3 KM.
 CLASS 13 = SNOW WITH VIS GE 3, LT 7 KM.
 CLASS 14 = SNOW WITH VIS GE 7 KM.
 CLASS 15 = NO WEATHER AND ABSOLUTE HUMIDITY LT 10 GM/CU M.
 CLASS 16 = NO WEATHER AND ABSOLUTE HUMIDITY GE 10 GM/CU M.
 CLASS 17 = VIS LT 1 KM AND CEILING HEIGHT LT 300 M.
 CLASS 18 = VIS LT 3 KM AND CEILING HEIGHT LT 1000 M.
 CLASS 19 = CEILING HEIGHT LT 300 M.
 CLASS 20 = CEILING HEIGHT LT 1000 M.
 CLASS 21 = NO CEILING.
 CLASS 22 = ALL CONDITIONS COMBINED.

EOSAEL CLIMATOLOGY FOR MIDDLE ATLANTIC COAST

DURING SUMMER AT 15-19 (LST)

CLASS NO.	FREQCY CLASS (%)	MEAN TEMP (C)	MEAN DP (C)	MEAN AH (GM/CU.M)	MEAN RH (%)	MEAN VIS (KM)	MEAN PRESS (MB)	MEAN/STDEV WNDVEL (MPS)
1	.0	22.8	20.4	17.8	86.9	.721	1012.9	6.0/ 2.9
2	.8	21.5	19.5	17.1	88.8	2.021	1014.3	3.9/ 2.3
3	13.8	26.5	20.7	18.0	72.3	5.357	1014.6	3.3/ 2.1
4	20.5	27.5	20.1	17.4	65.7	8.933	1014.7	3.2/ 1.8
5	.0	.0	.0	.0	.0	.000	.0	.0/ .0
6	.0	27.6	19.1	16.3	62.4	9.600	1012.0	4.2/ .9
7	.2	23.0	20.6	18.1	87.3	.724	1013.2	6.4/ 3.3
8	.8	21.1	19.1	16.8	89.1	1.961	1014.0	4.4/ 2.6
9	3.0	22.2	19.6	17.1	85.8	4.850	1014.1	3.8/ 2.3
10	4.2	23.1	19.1	16.7	79.1	11.247	1014.5	3.5/ 2.1
11	.0	.0	.0	.0	.0	.000	.0	.0/ .0
12	.0	.0	.0	.0	.0	.000	.0	.0/ .0
13	.0	.0	.0	.0	.0	.000	.0	.0/ .0
14	.0	.0	.0	.0	.0	.000	.0	.0/ .0
15	9.9	23.3	8.8	8.5	40.6	25.399	1017.6	4.1/ 2.0

16	48.9	26.4	17.3	14.8	58.7	16.383	1016.1	3.5/	1.9
17	.1	22.7	20.6	18.1	88.3	.710	1013.2	6.2/	3.3
18	1.1	21.8	19.7	17.2	88.2	1.795	1014.0	4.5/	2.6
19	26.4	25.0	19.0	16.5	71.2	10.019	1014.9	3.5/	2.1
20	29.7	24.9	19.1	16.5	71.7	10.067	1014.9	3.5/	2.1
21	40.6	27.1	16.3	14.1	53.3	16.488	1016.4	3.5/	1.9
22	100.0	26.2	17.6	15.2	61.2	13.980	1015.7	3.5/	2.0

CLASS NO.	FREQCY CLASS	MEAN CLDHT (KM)	MEAN/STDEV CLDCVR (PERCENT)	FREQCY A	FREQCY B	FREQCY C	FREQCY D	FREQCY E	FREQCY F
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1	.0	.110	100.0/	.0	.0	.0	100.0	.0	.0
2	.8	.251	99.9/	.8	.0	.0	98.7	.9	.4
3	13.8	2.189	88.6/	26.8	.0	2.2	6.8	83.9	2.6
4	20.5	4.840	74.8/	35.0	.2	6.8	16.9	65.3	3.8
5	.0	.000	.0/	.0	.0	.0	.0	.0	.0
6	.0	3.555	80.0/	44.7	.0	.0	.0	100.0	.0
7	.2	.100	100.0/	.0	.0	.0	.0	100.0	.0
8	.8	.254	99.9/	.8	.0	.0	.5	99.1	.0
9	3.0	.291	99.8/	3.5	.0	.2	.4	98.7	.7
10	4.2	1.056	99.1/	7.1	.0	.2	3.1	93.2	2.0
11	.0	.000	.0/	.0	.0	.0	.0	.0	.0
12	.0	.000	.0/	.0	.0	.0	.0	.0	.0
13	.0	.000	.0/	.0	.0	.0	.0	.0	.0
14	.0	.000	.0/	.0	.0	.0	.0	.0	.0
15	9.9	6.234	52.5/	38.0	.5	9.4	21.2	62.5	2.4
16	48.9	5.821	66.3/	36.7	.4	7.8	19.5	60.8	4.2
17	.1	.041	100.0/	.0	.0	.0	.0	100.0	.0
18	1.1	.090	100.0/	.0	.0	.0	.0	100.0	.0
19	26.4	.033	100.0/	.0	.0	.0	.0	100.0	.0
20	29.7	.110	100.0/	.3	.0	.0	.0	100.0	.0
21	40.6	2.978	29.2/	15.8	.7	15.1	29.0	38.9	3.9
22	100.0	4.846	71.2/	36.2	.3	6.5	16.5	66.9	3.6

CLASS NO.	FREQCY CLASS (%)	FREQCY WNDDIR 015 (%)	FREQCY WNDDIR 045 (%)	FREQCY WNDDIR 075 (%)	FREQCY WNDDIR 105 (%)	FREQCY WNDDIR 135 (%)	FREQCY WNDDIR 165 (%)	FREQCY WNDDIR 195 (%)
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1	.0	4.2	8.3	.0	12.5	.0	16.7	4.2
2	.8	4.9	16.1	15.7	8.1	9.9	9.0	4.5
3	13.8	3.2	5.7	8.1	8.0	9.2	12.1	11.6
4	20.5	2.4	3.9	4.9	6.8	10.2	13.7	13.8
5	.0	.0	.0	.0	.0	.0	.0	.0
6	.0	.0	.0	.0	20.0	.0	.0	20.0
7	.2	4.8	7.1	2.4	7.1	.0	9.5	4.8
8	.8	6.0	16.3	12.6	8.4	8.4	6.5	5.6
9	3.0	7.0	10.2	11.5	6.7	7.9	10.4	8.4
10	4.2	5.8	6.7	6.3	5.3	9.1	12.6	10.4
11	.0	.0	.0	.0	.0	.0	.0	.0
12	.0	.0	.0	.0	.0	.0	.0	.0

13	.0	.0	.0	.0	.0	.0	.0	.0
14	.0	.0	.0	.0	.0	.0	.0	.0
15	9.9	5.3	3.3	3.8	5.0	5.4	5.9	4.0
16	48.9	3.1	3.5	5.5	7.0	9.2	13.6	11.5
17	.1	4.9	7.3	2.4	9.8	.0	7.3	4.9
18	1.1	3.8	14.0	12.7	8.9	6.5	8.2	5.1
19	26.4	3.5	6.0	7.6	8.2	8.9	12.7	11.2
20	29.7	3.8	6.2	7.8	8.5	9.3	12.7	11.0
21	40.6	3.2	3.1	4.6	5.8	8.0	11.3	10.1
22	100.0	3.3	4.0	5.6	6.8	8.9	12.4	11.1

CLASS NO.	FREQCY CLASS (%)	FREQCY WNDDIR 225 (%)	FREQCY WNDDIR 255 (%)	FREQCY WNDDIR 285 (%)	FREQCY WNDDIR 315 (%)	FREQCY WNDDIR 345 (%)	FREQCY WNDDIR VBL (%)
1	.0	12.5	4.2	8.3	12.5	16.7	.0
2	.8	4.0	3.6	4.9	7.2	7.6	4.5
3	13.8	13.1	9.1	5.0	3.9	3.3	7.7
4	20.5	14.8	8.0	5.7	4.1	2.9	8.9
5	.0	.0	.0	.0	.0	.0	.0
6	.0	.0	60.0	.0	.0	.0	.0
7	.2	11.9	7.1	16.7	14.3	14.3	.0
8	.8	3.3	5.6	7.4	8.4	7.9	3.7
9	3.0	7.4	6.2	5.8	5.6	6.1	6.6
10	4.2	12.0	6.7	5.4	6.0	5.5	8.1
11	.0	.0	.0	.0	.0	.0	.0
12	.0	.0	.0	.0	.0	.0	.0
13	.0	.0	.0	.0	.0	.0	.0
14	.0	.0	.0	.0	.0	.0	.0
15	9.9	6.2	8.5	14.2	20.5	16.0	2.2
16	48.9	11.7	8.1	7.4	7.6	5.3	6.4
17	.1	14.6	7.3	9.8	14.6	17.1	.0
18	1.1	4.8	6.5	7.5	8.2	9.9	3.8
19	26.4	11.9	8.0	5.2	4.8	4.4	7.5
20	29.7	11.4	7.6	5.0	4.8	4.6	7.2
21	40.6	11.6	8.9	9.0	10.3	7.5	6.5
22	100.0	11.9	8.3	7.5	7.8	5.8	6.6

END EOSAEL RUN

STOP 000

5.3 Sample 2

Sample 2 shows how the weather changes over four different times of the day. It displays the same region and season for all four times. Looking at all four times of day helps you to understand if the weather changes and is variable or if it is more predictable.

5.3.1 Input File CLIMAT02.DAT

```
WAVL      10.591
CLIMAT      1.0      52.0      7.0      23.0      0.0      1.0
CLIMAT      1.0      52.0      7.0      03.0      0.0      1.0
CLIMAT      1.0      52.0      7.0      10.0      0.0      1.0
CLIMAT      1.0      52.0      7.0      16.0      0.0      1.0
STOP
# THE FOLLOWING IS EOSAEL SOURCE CONTROL INFORMATION YOU CAN SAFELY REMOVE IT
# SCCS  @(#) CLIMAT02.DAT 2.1 02/23/90
```

5.3.2 Output File CLIMAT02.OUT

The output file from the CLIMAT02.OUT file follows.

 WARNING - THIS LIBRARY CONTAINS TECHNICAL DATA WHOSE EXPORT IS RESTRICTED
 BY THE ARMS EXPORT CONTROL ACT (TITLE 22, U.S.C., SEC 2751 ET SEQ.) OR
 EXECUTIVE ORDER 12470. VIOLATION OF THESE EXPORT LAWS ARE SUBJECT TO
 SEVERE CRIMINAL PENALTIES.

1

 * ELECTRO-OPTICAL SYSTEMS *
 * ATMOSPHERIC EFFECTS LIBRARY *
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 * EOSAEL92 REV 2.2 03/07/91 *

WAVL 10.591
 NOTE: THAT THE ABOVE CARD WAS MODIFIED FOR CONSISTENCY TO:
 WAVL .1059E+02 .1059E+02 .0000E+00
 1

 * C L I M A T *
 * CLIMATOLOGY *
 * MODULE *
 * NOT FOR OPERATIONAL USE *
 * EOSAEL92 REV 1.5 04/03/91 *

CLIMATOLOGY MODEL

DEFINITIONS OF METEOROLOGICAL CLASSES

CLASS 1 = FOG, HAZE AND MIST WITH VIS LT 1 KM.
 CLASS 2 = FOG, HAZE AND MIST WITH VIS GE 1, LT 3 KM.
 CLASS 3 = FOG, HAZE AND MIST WITH VIS GE 3, LT 7 KM.
 CLASS 4 = FOG, HAZE AND MIST WITH VIS GE 7 KM.
 CLASS 5 = DUST WITH VIS LT 3 KM.
 CLASS 6 = DUST WITH VIS GE 3 KM.
 CLASS 7 = DRIZZLE, RAIN AND TSTMS WITH VIS LT 1 KM.
 CLASS 8 = DRIZZLE, RAIN AND TSTMS WITH VIS GE 1, LT 3 KM.
 CLASS 9 = DRIZZLE, RAIN AND TSTMS WITH VIS GE 3, LT 7 KM.
 CLASS 10 = DRIZZLE, RAIN AND TSTMS WITH VIS GE 7 KM.
 CLASS 11 = SNOW WITH VIS LT 1 KM.
 CLASS 12 = SNOW WITH VIS GE 1, LT 3 KM.
 CLASS 13 = SNOW WITH VIS GE 3, LT 7 KM.
 CLASS 14 = SNOW WITH VIS GE 7 KM.
 CLASS 15 = NO WEATHER AND ABSOLUTE HUMIDITY LT 10 GM/CU M.
 CLASS 16 = NO WEATHER AND ABSOLUTE HUMIDITY GE 10 GM/CU M.
 CLASS 17 = VIS LT 1 KM AND CEILING HEIGHT LT 300 M.
 CLASS 18 = VIS LT 3 KM AND CEILING HEIGHT LT 1000 M.
 CLASS 19 = CEILING HEIGHT LT 300 M.
 CLASS 20 = CEILING HEIGHT LT 1000 M.
 CLASS 21 = NO CEILING.
 CLASS 22 = ALL CONDITIONS COMBINED.

EOSAEL CLIMATOLOGY FOR SOUTHERN ROCKY MOUNTAINS DURING SUMMER AT 20-02 (LST)

CLASS NO.	FREQCY CLASS (%)	MEAN TEMP (C)	MEAN DP (C)	MEAN AH (GM/CU.M)	MEAN RH (%)	MEAN VIS (KM)	MEAN PRESS (MB)	MEAN/STDEV WNDVEL (MPS)
1	.0	.0	.0	.0	.0	.000	.0	.0/ .0
2	.0	.0	.0	.0	.0	.000	.0	.0/ .0
3	.0	.0	.0	.0	.0	.000	.0	.0/ .0
4	.1	22.4	13.2	11.9	66.5	28.200	1011.1	4.5/ 3.5
5	.0	28.5	7.9	8.0	30.5	1.067	1006.7	8.2/ 2.1
6	.2	27.8	7.7	8.0	30.7	18.756	1007.1	7.7/ 3.6
7	.0	.0	.0	.0	.0	.000	.0	.0/ .0
8	.0	19.7	14.5	12.5	72.3	2.133	1011.6	7.3/ 4.5
9	.2	18.8	16.9	14.6	89.6	4.965	1014.8	3.7/ 1.6
10	8.6	23.2	14.8	12.7	63.3	32.141	1012.1	3.8/ 2.5
11	.0	.0	.0	.0	.0	.000	.0	.0/ .0
12	.0	.0	.0	.0	.0	.000	.0	.0/ .0
13	.0	.0	.0	.0	.0	.000	.0	.0/ .0
14	.0	.0	.0	.0	.0	.000	.0	.0/ .0
15	50.2	26.2	4.9	6.7	27.7	50.636	1008.7	2.8/ 2.0

16	40.7	23.7	14.6	12.4	58.6	46.215	1011.7	2.4/	1.9
17	.0	.0	.0	.0	.0	.000	.0	.0/	.0
18	.0	24.2	10.9	10.0	51.4	1.760	1008.7	7.3/	3.3
19	12.1	23.1	13.9	12.2	61.6	34.881	1011.6	3.3/	2.4
20	12.3	23.0	13.9	12.2	61.6	34.822	1011.6	3.3/	2.4
21	59.3	25.2	7.7	8.4	37.3	50.092	1009.6	2.6/	1.9
22	100.0	24.9	9.7	9.6	43.5	47.051	1010.2	2.8/	2.0

CLASS NO.	FREQCY CLASS	MEAN CLDHT (KM)	MEAN/STDEV CLDCVR (PERCENT)	FREQCY A	FREQCY B	FREQCY C	FREQCY D	FREQCY E	FREQCY F
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1	.0	.000	.0/	.0	.0	.0	.0	.0	.0
2	.0	.000	.0/	.0	.0	.0	.0	.0	.0
3	.0	.000	.0/	.0	.0	.0	.0	.0	.0
4	.1	1.007	79.7/	38.9	.0	.0	.0	87.5	.0
5	.0	.620	100.0/	.0	.0	.0	.0	100.0	.0
6	.2	3.350	80.6/	38.9	.0	.0	.0	94.4	.0
7	.0	.000	.0/	.0	.0	.0	.0	.0	.0
8	.0	.030	100.0/	.0	.0	.0	.0	100.0	.0
9	.2	.219	100.0/	.0	.0	.0	.0	100.0	.0
10	8.6	2.124	93.8/	20.3	.0	.0	.0	78.9	11.3
11	.0	.000	.0/	.0	.0	.0	.0	.0	.0
12	.0	.000	.0/	.0	.0	.0	.0	.0	.0
13	.0	.000	.0/	.0	.0	.0	.0	.0	.0
14	.0	.000	.0/	.0	.0	.0	.0	.0	.0
15	50.2	5.681	37.8/	37.2	.0	.0	.0	19.5	22.8
16	40.7	5.522	65.6/	37.7	.0	.0	.0	31.1	19.9
17	.0	.000	.0/	.0	.0	.0	.0	.0	.0
18	.0	.030	100.0/	.0	.0	.0	.0	100.0	.0
19	12.1	.030	100.0/	.0	.0	.0	.0	100.0	.0
20	12.3	.041	100.0/	.0	.0	.0	.0	100.0	.0
21	59.3	3.657	22.8/	18.5	.0	.0	.0	8.3	21.3
22	100.0	5.190	54.2/	40.5	.0	.0	.0	29.7	20.5

CLASS NO.	FREQCY CLASS (%)	FREQCY WNDDIR 015 (%)	FREQCY WNDDIR 045 (%)	FREQCY WNDDIR 075 (%)	FREQCY WNDDIR 105 (%)	FREQCY WNDDIR 135 (%)	FREQCY WNDDIR 165 (%)	FREQCY WNDDIR 195 (%)
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1	.0	.0	.0	.0	.0	.0	.0	.0
2	.0	.0	.0	.0	.0	.0	.0	.0
3	.0	.0	.0	.0	.0	.0	.0	.0
4	.1	12.5	.0	.0	12.5	25.0	.0	.0
5	.0	33.3	.0	.0	.0	.0	.0	.0
6	.2	5.6	.0	11.1	5.6	.0	.0	.0
7	.0	.0	.0	.0	.0	.0	.0	.0
8	.0	.0	.0	.0	.0	.0	33.3	.0
9	.2	17.6	17.6	.0	5.9	.0	5.9	23.5
10	8.6	10.4	6.8	6.2	6.0	9.4	7.8	6.2
11	.0	.0	.0	.0	.0	.0	.0	.0
12	.0	.0	.0	.0	.0	.0	.0	.0

13	.0	.0	.0	.0	.0	.0	.0	.0
14	.0	.0	.0	.0	.0	.0	.0	.0
15	50.2	4.3	4.1	6.2	9.0	15.0	12.4	6.0
16	40.7	8.3	6.8	5.5	8.0	13.8	12.0	4.8
17	.0	.0	.0	.0	.0	.0	.0	.0
18	.0	.0	.0	.0	.0	.0	20.0	.0
19	12.1	11.2	6.9	5.5	4.7	8.1	10.8	5.4
20	12.3	11.2	7.2	5.4	4.7	8.1	10.7	5.4
21	59.3	5.0	4.9	5.7	9.9	16.5	12.6	5.6
22	100.0	6.5	5.5	5.9	8.3	14.0	11.8	5.5

CLASS NO.	FREQCY CLASS (%)	FREQCY WNDDIR 225 (%)	FREQCY WNDDIR 255 (%)	FREQCY WNDDIR 285 (%)	FREQCY WNDDIR 315 (%)	FREQCY WNDDIR 345 (%)	FREQCY WNDDIR VBL (%)
1	.0	.0	.0	.0	.0	.0	.0
2	.0	.0	.0	.0	.0	.0	.0
3	.0	.0	.0	.0	.0	.0	.0
4	.1	.0	12.5	12.5	.0	12.5	12.5
5	.0	.0	66.7	.0	.0	.0	.0
6	.2	27.8	22.2	5.6	16.7	5.6	.0
7	.0	.0	.0	.0	.0	.0	.0
8	.0	.0	.0	.0	.0	66.7	.0
9	.2	5.9	.0	5.9	.0	11.8	5.9
10	8.6	7.5	7.8	6.2	5.3	11.3	9.3
11	.0	.0	.0	.0	.0	.0	.0
12	.0	.0	.0	.0	.0	.0	.0
13	.0	.0	.0	.0	.0	.0	.0
14	.0	.0	.0	.0	.0	.0	.0
15	50.2	6.8	9.3	7.2	3.7	4.4	11.5
16	40.7	4.7	5.0	4.1	3.7	7.0	16.4
17	.0	.0	.0	.0	.0	.0	.0
18	.0	.0	40.0	.0	.0	40.0	.0
19	12.1	5.7	9.3	7.0	4.4	10.4	10.6
20	12.3	5.7	9.1	7.0	4.6	10.5	10.5
21	59.3	5.9	7.2	5.7	3.3	4.3	13.6
22	100.0	6.0	7.4	5.9	3.9	6.1	13.3

EOSAEL CLIMATOLOGY FOR SOUTHERN ROCKY MOUNTAINS DURING SUMMER AT 03-09 (LST)

CLASS NO.	FREQCY CLASS (%)	MEAN TEMP (C)	MEAN DP (C)	MEAN AH (GM/CU.M)	MEAN RH (%)	MEAN VIS (KM)	MEAN PRESS (MB)	MEAN/STDEV WNDVEL (MPS)
1	.0	.0	.0	.0	.0	.000	.0	.0/ .0
2	.0	.0	.0	.0	.0	.000	.0	.0/ .0
3	.0	.0	.0	.0	.0	.000	.0	.0/ .0
4	.3	21.0	11.0	10.8	61.4	62.400	1011.7	3.1/ 2.6
5	.0	.0	.0	.0	.0	.000	.0	.0/ .0
6	.0	.0	.0	.0	.0	.000	.0	.0/ .0

7	.0	.0	.0	.0	.0	.000	.0	.0/	.0
8	.0	.0	.0	.0	.0	.000	.0	.0/	.0
9	.0	.0	.0	.0	.0	.000	.0	.0/	.0
10	2.5	20.5	15.5	13.4	76.5	40.972	1013.0	2.7/	2.0
11	.0	.0	.0	.0	.0	.000	.0	.0/	.0
12	.0	.0	.0	.0	.0	.000	.0	.0/	.0
13	.0	.0	.0	.0	.0	.000	.0	.0/	.0
14	.0	.0	.0	.0	.0	.000	.0	.0/	.0
15	42.6	22.7	5.4	7.0	35.3	71.845	1010.9	2.0/	2.0
16	54.5	22.4	14.7	12.5	63.4	65.366	1013.2	1.8/	1.6
17	.0	.0	.0	.0	.0	.000	.0	.0/	.0
18	.0	.0	.0	.0	.0	.000	.0	.0/	.0
19	5.8	21.4	14.7	12.8	69.3	56.673	1013.5	2.2/	1.8
20	6.1	21.4	14.8	12.9	70.0	55.520	1013.5	2.2/	1.7
21	69.4	22.6	9.5	9.4	47.5	69.994	1011.9	1.9/	1.8
22	100.0	22.5	10.7	10.2	51.8	67.510	1012.2	1.9/	1.8

CLASS NO.	FREQCY CLASS	MEAN CLDHT (KM)	MEAN/STDEV CLDCVR (PERCENT)	FREQCY A	FREQCY B	FREQCY C	FREQCY D	FREQCY E	FREQCY F
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1	.0	.000	.0/	.0	.0	.0	.0	.0	.0
2	.0	.000	.0/	.0	.0	.0	.0	.0	.0
3	.0	.000	.0/	.0	.0	.0	.0	.0	.0
4	.3	4.401	57.4/	39.5	.0	5.9	5.9	58.8	.0
5	.0	.000	.0/	.0	.0	.0	.0	.0	.0
6	.0	.000	.0/	.0	.0	.0	.0	.0	.0
7	.0	.000	.0/	.0	.0	.0	.0	.0	.0
8	.0	.000	.0/	.0	.0	.0	.0	.0	.0
9	.0	.000	.0/	.0	.0	.0	.0	.0	.0
10	2.5	1.795	92.5/	22.0	.0	.0	2.6	71.0	12.9
11	.0	.000	.0/	.0	.0	.0	.0	.0	.0
12	.0	.000	.0/	.0	.0	.0	.0	.0	.0
13	.0	.000	.0/	.0	.0	.0	.0	.0	.0
14	.0	.000	.0/	.0	.0	.0	.0	.0	.0
15	42.6	7.076	31.3/	33.1	3.9	27.7	17.6	9.9	5.8
16	54.5	6.069	56.9/	37.8	2.2	22.7	22.1	22.1	5.7
17	.0	.000	.0/	.0	.0	.0	.0	.0	.0
18	.0	.000	.0/	.0	.0	.0	.0	.0	.0
19	5.8	.032	100.0/	.0	.0	.0	100.0	.0	.0
20	6.1	.061	100.0/	.0	.0	.0	100.0	.0	.0
21	69.4	4.190	23.4/	18.3	4.1	33.8	18.7	4.3	3.7
22	100.0	6.270	46.8/	38.4	2.9	24.2	19.6	18.2	5.9

CLASS NO.	FREQCY CLASS (%)	FREQCY WNDDIR 015 (%)	FREQCY WNDDIR 045 (%)	FREQCY WNDDIR 075 (%)	FREQCY WNDDIR 105 (%)	FREQCY WNDDIR 135 (%)	FREQCY WNDDIR 165 (%)	FREQCY WNDDIR 195 (%)
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1	.0	.0	.0	.0	.0	.0	.0	.0
2	.0	.0	.0	.0	.0	.0	.0	.0
3	.0	.0	.0	.0	.0	.0	.0	.0

4	.3	11.8	5.9	5.9	17.6	11.8	.0	5.9
5	.0	.0	.0	.0	.0	.0	.0	.0
6	.0	.0	.0	.0	.0	.0	.0	.0
7	.0	.0	.0	.0	.0	.0	.0	.0
8	.0	.0	.0	.0	.0	.0	.0	.0
9	.0	.0	.0	.0	.0	.0	.0	.0
10	2.5	14.8	6.5	7.1	5.8	8.4	6.5	7.1
11	.0	.0	.0	.0	.0	.0	.0	.0
12	.0	.0	.0	.0	.0	.0	.0	.0
13	.0	.0	.0	.0	.0	.0	.0	.0
14	.0	.0	.0	.0	.0	.0	.0	.0
15	42.6	8.6	7.3	5.5	6.2	9.6	9.3	4.0
16	54.5	9.8	7.6	5.2	5.7	9.1	9.1	4.1
17	.0	.0	.0	.0	.0	.0	.0	.0
18	.0	.0	.0	.0	.0	.0	.0	.0
19	5.8	9.3	3.8	5.5	5.2	6.8	13.4	3.6
20	6.1	10.0	4.5	5.8	5.2	6.8	13.1	3.4
21	69.4	9.4	7.9	5.6	6.1	9.2	8.4	4.1
22	100.0	9.4	7.4	5.4	5.9	9.3	9.1	4.1

CLASS NO.	FREQCY CLASS (%)	FREQCY WNDDIR 225 (%)	FREQCY WNDDIR 255 (%)	FREQCY WNDDIR 285 (%)	FREQCY WNDDIR 315 (%)	FREQCY WNDDIR 345 (%)	FREQCY WNDDIR VBL (%)
1	.0	.0	.0	.0	.0	.0	.0
2	.0	.0	.0	.0	.0	.0	.0
3	.0	.0	.0	.0	.0	.0	.0
4	.3	5.9	5.9	.0	5.9	11.8	11.8
5	.0	.0	.0	.0	.0	.0	.0
6	.0	.0	.0	.0	.0	.0	.0
7	.0	.0	.0	.0	.0	.0	.0
8	.0	.0	.0	.0	.0	.0	.0
9	.0	.0	.0	.0	.0	.0	.0
10	2.5	4.5	1.3	1.3	5.8	17.4	13.5
11	.0	.0	.0	.0	.0	.0	.0
12	.0	.0	.0	.0	.0	.0	.0
13	.0	.0	.0	.0	.0	.0	.0
14	.0	.0	.0	.0	.0	.0	.0
15	42.6	3.9	4.3	6.2	5.5	8.0	21.5
16	54.5	3.0	2.9	5.2	5.0	7.0	26.3
17	.0	.0	.0	.0	.0	.0	.0
18	.0	.0	.0	.0	.0	.0	.0
19	5.8	4.1	4.4	4.9	6.3	9.0	23.6
20	6.1	3.9	4.2	5.0	6.0	9.2	22.8
21	69.4	3.4	3.7	5.6	5.2	6.9	24.5
22	100.0	3.4	3.5	5.5	5.3	7.7	23.9

EOSAEL CLIMATOLOGY FOR SOUTHERN ROCKY MOUNTAINS

DURING SUMMER AT 10-14 (LST)

CLASS NO.	FREQCY CLASS (%)	MEAN TEMP (C)	MEAN DP (C)	MEAN AH (GM/CU.M)	MEAN RH (%)	MEAN VIS (KM)	MEAN PRESS (MB)	MEAN/STDEV WNDVEL (MPS)
1	.0	.0	.0	.0	.0	.000	.0	.0/ .0
2	.0	.0	.0	.0	.0	.000	.0	.0/ .0
3	.0	.0	.0	.0	.0	.000	.0	.0/ .0
4	.3	29.5	12.4	10.8	39.0	43.491	1012.0	3.2/ 2.2
5	.0	.0	.0	.0	.0	.000	.0	.0/ .0
6	.0	30.5	3.5	6.1	20.5	64.000	1011.8	7.0/ 2.1
7	.0	.0	.0	.0	.0	.000	.0	.0/ .0
8	.0	.0	.0	.0	.0	.000	.0	.0/ .0
9	.0	22.5	15.5	13.3	74.2	4.800	1016.4	3.9/ 2.6
10	5.2	26.2	14.7	12.4	52.6	59.378	1012.8	3.7/ 2.3
11	.0	.0	.0	.0	.0	.000	.0	.0/ .0
12	.0	.0	.0	.0	.0	.000	.0	.0/ .0
13	.0	.0	.0	.0	.0	.000	.0	.0/ .0
14	.0	.0	.0	.0	.0	.000	.0	.0/ .0
15	53.6	32.4	5.9	7.0	20.4	76.242	1009.9	3.3/ 1.9
16	40.6	29.2	14.6	12.1	42.3	70.713	1012.6	2.5/ 1.7
17	.0	.0	.0	.0	.0	.000	.0	.0/ .0
18	.0	.0	.0	.0	.0	.000	.0	.0/ .0
19	4.0	26.4	12.6	11.3	49.0	58.319	1012.5	3.3/ 2.3
20	4.6	26.1	13.0	11.5	50.5	58.510	1012.6	3.2/ 2.2
21	67.8	31.6	8.8	8.7	27.0	75.048	1010.8	2.9/ 1.8
22	100.0	30.8	9.9	9.4	31.1	72.967	1011.2	3.0/ 1.9

CLASS NO.	FREQCY CLASS	MEAN CLDHT (KM)	MEAN/STDEV CLDCVR (PERCENT)	FREQCY A	FREQCY B	FREQCY C	FREQCY D	FREQCY E	FREQCY F
1	.0	.000	.0/ .0	.0	.0	.0	.0	.0	.0
2	.0	.000	.0/ .0	.0	.0	.0	.0	.0	.0
3	.0	.000	.0/ .0	.0	.0	.0	.0	.0	.0
4	.3	5.123	56.3/ 43.6	18.2	45.5	18.2	18.2	.0	.0
5	.0	.000	.0/ .0	.0	.0	.0	.0	.0	.0
6	.0	.000	45.8/ 50.5	.0	.0	66.7	33.3	.0	.0
7	.0	.000	.0/ .0	.0	.0	.0	.0	.0	.0
8	.0	.000	.0/ .0	.0	.0	.0	.0	.0	.0
9	.0	.470	100.0/ .0	.0	.0	.0	100.0	.0	.0
10	5.2	2.605	93.0/ 19.8	7.5	14.8	13.8	64.0	.0	.0
11	.0	.000	.0/ .0	.0	.0	.0	.0	.0	.0
12	.0	.000	.0/ .0	.0	.0	.0	.0	.0	.0
13	.0	.000	.0/ .0	.0	.0	.0	.0	.0	.0
14	.0	.000	.0/ .0	.0	.0	.0	.0	.0	.0
15	53.6	5.185	40.4/ 33.6	34.1	34.7	22.5	8.7	.0	.0
16	40.6	4.681	60.3/ 34.3	36.1	32.9	15.6	15.4	.0	.0
17	.0	.000	.0/ .0	.0	.0	.0	.0	.0	.0
18	.0	.000	.0/ .0	.0	.0	.0	.0	.0	.0

19	4.0	.030	100.0/	.0	.0	.0	.0	100.0	.0	.0
20	4.6	.116	100.0/	.0	.0	.0	.0	100.0	.0	.0
21	67.8	2.664	28.3/	16.3	47.7	34.2	17.6	.5	.0	.0
22	100.0	4.791	51.4/	36.1	33.4	32.9	19.2	14.5	.0	.0

CLASS NO.	FREQCY CLASS (%)	FREQCY WNDDIR 015 (%)	FREQCY WNDDIR 045 (%)	FREQCY WNDDIR 075 (%)	FREQCY WNDDIR 105 (%)	FREQCY WNDDIR 135 (%)	FREQCY WNDDIR 165 (%)	FREQCY WNDDIR 195 (%)
1	.0	.0	.0	.0	.0	.0	.0	.0
2	.0	.0	.0	.0	.0	.0	.0	.0
3	.0	.0	.0	.0	.0	.0	.0	.0
4	.3	4.5	13.6	4.5	13.6	18.2	.0	13.6
5	.0	.0	.0	.0	.0	.0	.0	.0
6	.0	33.3	33.3	.0	.0	.0	.0	.0
7	.0	.0	.0	.0	.0	.0	.0	.0
8	.0	.0	.0	.0	.0	.0	.0	.0
9	.0	.0	.0	.0	.0	.0	.0	.0
10	5.2	7.8	8.3	8.8	9.3	9.3	11.5	6.0
11	.0	.0	.0	.0	.0	.0	.0	.0
12	.0	.0	.0	.0	.0	.0	.0	.0
13	.0	.0	.0	.0	.0	.0	.0	.0
14	.0	.0	.0	.0	.0	.0	.0	.0
15	53.6	3.3	4.2	5.8	7.2	9.0	10.8	10.6
16	40.6	4.5	5.0	7.7	9.6	12.1	11.3	8.1
17	.0	.0	.0	.0	.0	.0	.0	.0
18	.0	.0	.0	.0	.0	.0	.0	.0
19	4.0	5.2	6.5	9.4	9.8	9.4	10.4	7.5
20	4.6	4.9	7.5	9.8	10.1	10.4	10.1	6.9
21	67.8	3.6	4.3	5.9	7.7	10.2	11.5	9.6
22	100.0	4.1	4.7	6.7	8.3	10.3	11.0	9.3

CLASS NO.	FREQCY CLASS (%)	FREQCY WNDDIR 225 (%)	FREQCY WNDDIR 255 (%)	FREQCY WNDDIR 285 (%)	FREQCY WNDDIR 315 (%)	FREQCY WNDDIR 345 (%)	FREQCY WNDDIR VBL (%)
1	.0	.0	.0	.0	.0	.0	.0
2	.0	.0	.0	.0	.0	.0	.0
3	.0	.0	.0	.0	.0	.0	.0
4	.3	9.1	4.5	9.1	.0	.0	9.1
5	.0	.0	.0	.0	.0	.0	.0
6	.0	.0	.0	33.3	.0	.0	.0
7	.0	.0	.0	.0	.0	.0	.0
8	.0	.0	.0	.0	.0	.0	.0
9	.0	33.3	.0	33.3	.0	33.3	.0
10	5.2	8.3	7.3	10.3	2.5	5.0	6.0
11	.0	.0	.0	.0	.0	.0	.0
12	.0	.0	.0	.0	.0	.0	.0
13	.0	.0	.0	.0	.0	.0	.0
14	.0	.0	.0	.0	.0	.0	.0

15	53.6	12.2	11.5	8.8	6.1	4.5	5.9
16	40.6	8.2	6.9	6.0	4.8	5.0	10.8
17	.0	.0	.0	.0	.0	.0	.0
18	.0	.0	.0	.0	.0	.0	.0
19	4.0	5.9	10.4	6.8	4.6	5.2	8.8
20	4.6	6.3	9.2	6.1	4.6	4.9	9.2
21	67.8	11.6	9.9	7.7	5.6	4.6	7.6
22	100.0	10.3	9.4	7.8	5.4	4.7	8.0

EOSAEL CLIMATOLOGY FOR SOUTHERN ROCKY MOUNTAINS DURING SUMMER AT 15-19 (LST)

CLASS NO.	FREQCY CLASS (%)	MEAN TEMP (C)	MEAN DP (C)	MEAN AH (GM/CU.M)	MEAN RH (%)	MEAN VIS (KM)	MEAN PRESS (MB)	MEAN/STDEV WNDVEL (MPS)
1	.0	.0	.0	.0	.0	.000	.0	.0/ .0
2	.0	.0	.0	.0	.0	.000	.0	.0/ .0
3	.0	.0	.0	.0	.0	.000	.0	.0/ .0
4	.0	.0	.0	.0	.0	.000	.0	.0/ .0
5	.0	31.6	9.0	8.5	27.2	1.600	1006.7	13.5/ 1.5
6	.4	31.9	6.6	8.0	24.6	12.369	1007.3	10.2/ 2.3
7	.0	.0	.0	.0	.0	.000	.0	.0/ .0
8	.0	21.2	17.3	14.7	78.4	1.733	1011.8	6.0/ 4.0
9	.0	.0	.0	.0	.0	.000	.0	.0/ .0
10	16.5	28.7	13.0	11.2	42.5	63.965	1010.0	4.5/ 2.4
11	.0	.0	.0	.0	.0	.000	.0	.0/ .0
12	.0	.0	.0	.0	.0	.000	.0	.0/ .0
13	.0	.0	.0	.0	.0	.000	.0	.0/ .0
14	.0	.0	.0	.0	.0	.000	.0	.0/ .0
15	59.6	33.7	5.2	6.6	18.2	76.500	1007.8	3.9/ 2.2
16	23.3	29.3	14.4	12.0	42.0	69.089	1010.6	3.3/ 2.0
17	.0	.0	.0	.0	.0	.000	.0	.0/ .0
18	.1	25.5	14.0	12.3	57.9	1.280	1009.4	10.5/ 3.7
19	7.1	26.6	12.0	11.0	46.9	58.197	1010.6	4.3/ 2.8
20	7.2	26.5	12.1	11.0	47.3	58.349	1010.6	4.3/ 2.8
21	51.4	33.6	6.0	7.2	20.0	78.179	1008.0	3.7/ 2.1
22	100.0	31.8	8.6	8.6	27.8	72.329	1008.8	3.8/ 2.3

CLASS NO.	FREQCY CLASS	MEAN CLDHT (KM)	MEAN/STDEV CLDCVR (PERCENT)	FREQCY A	FREQCY B	FREQCY C	FREQCY D	FREQCY E	FREQCY F
1	.0	.000	.0/ .0	.0	.0	.0	.0	.0	.0
2	.0	.000	.0/ .0	.0	.0	.0	.0	.0	.0
3	.0	.000	.0/ .0	.0	.0	.0	.0	.0	.0
4	.0	.000	.0/ .0	.0	.0	.0	.0	.0	.0
5	.0	1.220	100.0/ .0	.0	.0	.0	100.0	.0	.0
6	.4	8.915	92.3/ 27.7	.0	.0	.0	100.0	.0	.0
7	.0	.000	.0/ .0	.0	.0	.0	.0	.0	.0
8	.0	.520	100.0/ .0	.0	.0	.0	100.0	.0	.0
9	.0	.000	.0/ .0	.0	.0	.0	.0	.0	.0

10	16.5	3.465	92.8/	19.4	.0	2.3	11.1	86.5	.0	.0
11	.0	.000	.0/	.0	.0	.0	.0	.0	.0	.0
12	.0	.000	.0/	.0	.0	.0	.0	.0	.0	.0
13	.0	.000	.0/	.0	.0	.0	.0	.0	.0	.0
14	.0	.000	.0/	.0	.0	.0	.0	.0	.0	.0
15	59.6	4.976	50.7/	35.2	.0	10.4	41.9	47.7	.0	.0
16	23.3	4.621	78.8/	29.8	.0	8.7	29.9	61.3	.0	.0
17	.0	.000	.0/	.0	.0	.0	.0	.0	.0	.0
18	.1	.030	100.0/	.0	.0	.0	.0	100.0	.0	.0
19	7.1	.030	100.0/	.0	.0	.0	.0	100.0	.0	.0
20	7.2	.043	100.0/	.0	.0	.0	.0	100.0	.0	.0
21	51.4	2.385	31.0/	15.1	.0	16.7	54.3	29.1	.0	.0
22	100.0	4.620	64.4/	36.2	.0	8.6	33.9	57.5	.0	.0

CLASS	FREQCY	FREQCY	FREQCY	FREQCY	FREQCY	FREQCY	FREQCY	FREQCY
NO.	CLASS	WNDDIR	WNDDIR	WNDDIR	WNDDIR	WNDDIR	WNDDIR	WNDDIR
	(%)	015	045	075	105	135	165	195
		(%)	(%)	(%)	(%)	(%)	(%)	(%)

1	.0	.0	.0	.0	.0	.0	.0	.0
2	.0	.0	.0	.0	.0	.0	.0	.0
3	.0	.0	.0	.0	.0	.0	.0	.0
4	.0	.0	.0	.0	.0	.0	.0	.0
5	.0	.0	.0	.0	.0	.0	.0	66.7
6	.4	7.7	7.7	.0	7.7	7.7	7.7	7.7
7	.0	.0	.0	.0	.0	.0	.0	.0
8	.0	33.3	.0	.0	.0	.0	33.3	.0
9	.0	.0	.0	.0	.0	.0	.0	.0
10	16.5	7.2	8.4	8.4	11.7	11.5	9.2	7.5
11	.0	.0	.0	.0	.0	.0	.0	.0
12	.0	.0	.0	.0	.0	.0	.0	.0
13	.0	.0	.0	.0	.0	.0	.0	.0
14	.0	.0	.0	.0	.0	.0	.0	.0
15	59.6	2.9	3.2	4.8	6.3	9.3	10.3	8.8
16	23.3	4.6	4.2	6.3	7.0	12.4	11.8	8.4
17	.0	.0	.0	.0	.0	.0	.0	.0
18	.1	20.0	.0	.0	.0	.0	.0	20.0
19	7.1	4.6	3.8	5.9	5.4	8.8	5.9	6.7
20	7.2	4.5	3.7	6.6	5.3	8.6	5.8	6.6
21	51.4	2.8	3.6	4.0	6.3	9.3	11.1	9.1
22	100.0	4.0	4.3	5.7	7.3	10.4	10.5	8.5

CLASS	FREQCY	FREQCY	FREQCY	FREQCY	FREQCY	FREQCY	FREQCY
NO.	CLASS	WNDDIR	WNDDIR	WNDDIR	WNDDIR	WNDDIR	WNDDIR
	(%)	225	255	285	315	345	VBL
		(%)	(%)	(%)	(%)	(%)	(%)

1	.0	.0	.0	.0	.0	.0	.0
2	.0	.0	.0	.0	.0	.0	.0
3	.0	.0	.0	.0	.0	.0	.0
4	.0	.0	.0	.0	.0	.0	.0
5	.0	.0	.0	.0	33.3	.0	.0

6	.4	7.7	30.8	7.7	7.7	.0	.0
7	.0	.0	.0	.0	.0	.0	.0
8	.0	.0	.0	.0	33.3	.0	.0
9	.0	.0	.0	.0	.0	.0	.0
10	16.5	5.7	10.6	5.6	5.9	4.7	3.6
11	.0	.0	.0	.0	.0	.0	.0
12	.0	.0	.0	.0	.0	.0	.0
13	.0	.0	.0	.0	.0	.0	.0
14	.0	.0	.0	.0	.0	.0	.0
15	59.6	13.1	15.1	11.6	6.3	4.0	4.2
16	23.3	7.6	8.7	12.2	6.6	3.2	7.1
17	.0	.0	.0	.0	.0	.0	.0
18	.1	.0	.0	.0	60.0	.0	.0
19	7.1	10.9	16.3	15.1	9.2	2.9	4.6
20	7.2	10.7	16.0	14.8	9.5	2.9	4.9
21	51.4	13.0	14.8	12.1	6.2	3.8	3.8
22	100.0	10.5	12.9	10.7	6.4	3.9	4.7

END EOSAEL RUN

STOP 000

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Acronyms

ARL	Army Research Laboratory
ASL	Atmospheric Sciences Laboratory
EOSAEL	Electro-Optical Systems Atmospheric Effects Library
GEOSEM	Global Electro-Optical Systems Environmental Matrix
MOA	memorandum of agreement
TECNET	Test and Evaluation Community Network

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